COMPRESSED AIR MAGAZINE

DEVOTED TO THE USEFUL APPLICATIONS OF COMPRESSED AIR

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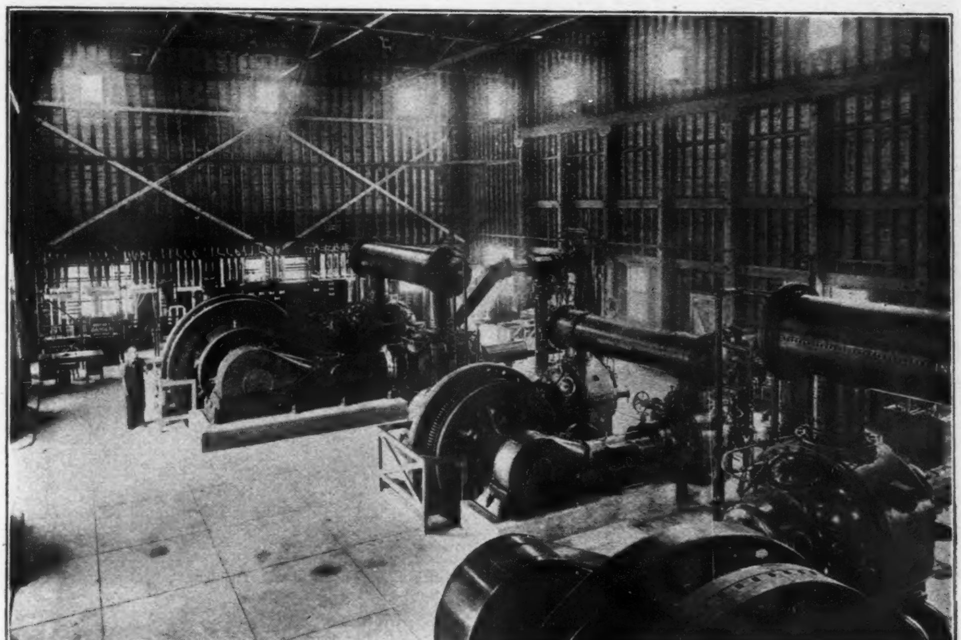
COMPRESSED AIR MAGAZINE

EVERYTHING PNEUMATIC

Vol. xxiii OCTOBER, 1918 No. 10



ONE OF THE FIVE COMPRESSOR INSTALLATIONS

HOG ISLAND COMPRESSED AIR INSTALLATION

For the following information, with the admirable photos accompanying, we are indebted to Mr. T. Holbrook, President of the American International Shipbuilding Corporation. A portion of the matter is a repetition of our preceding issue, but it is considered better to present it here entire to give a good understanding of the illustrations. The numbers of these pictures in existence is already immense and they are being added to daily and they will form a historical record of inestimable value. Many motion pictures also are being produced. To give a completely realistic effect these should be accompanied by phonographic reproductions of the rattle of the pneumatic tools. There are many, however, who would prefer not to be at once both spectators and auditors.

The Compressed Air System at Hog Island is planned to furnish compressed air at 100

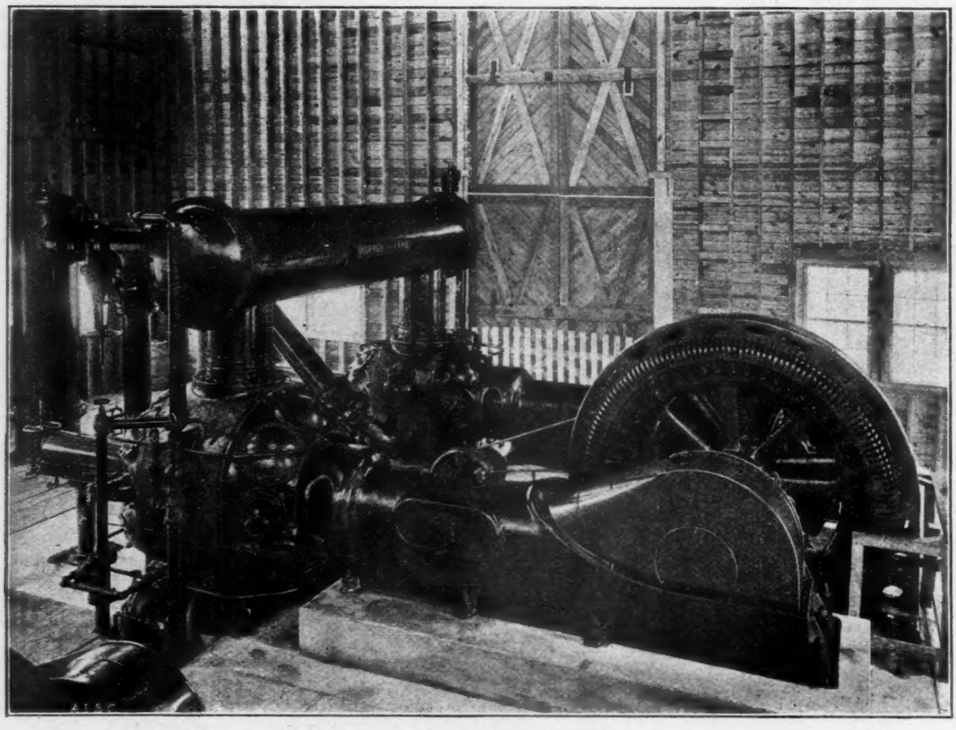
lbs. initial pressure for all necessary uses on the ships while on the ways and at outfitting piers, to the shops and to the Training School.

In general, the system consists of a 10 in. standard steel pipe main, extending along the head of the shipways, parallel to Front Street, and 98 ft. distance therefrom. This main is subdivided by sectionalizing valves; and provision for expansion and inspection is made by the introduction of generous "U" Bends and the use of a Box Trench, the cover of which is easily removable. From this 10 in. header, two six inch lines are taken down each shipway, running parallel to the keel blocks, and on each side of them. A tee and manifold with outlet cocks is inserted at each random length.

Another main six inches in diameter extends along the Marginal Wharf of the Outfitting Piers, under West Second Street, and 3 in. branches are taken down each side of each of the piers. Outlets similar to those on the shipways are inserted in these branch lines. The 6 in. main and the 10 in. main are connected together.

At intervals along the 10 in. main, approximately at the mid-point of each group of ten ways, an air compressor plant feeds the system through a 12 in. pipe line. These five compressor plants are identical, and contain the following equipment:

Two Ingersoll-Rand Class PRE-2 Air Compressors, each 40 in. and 25½x30 in., direct connected to a 1020 h. p. General Electric 4,000 volt, 3 phase, 60 cycle synchronous motor, having a speed of 138½ R.P.M. The actual delivered capacity of each of these compressors is 5,320 cu. ft. free air per minute.



ONE OF TEN LARGE AIR COMPRESSORS

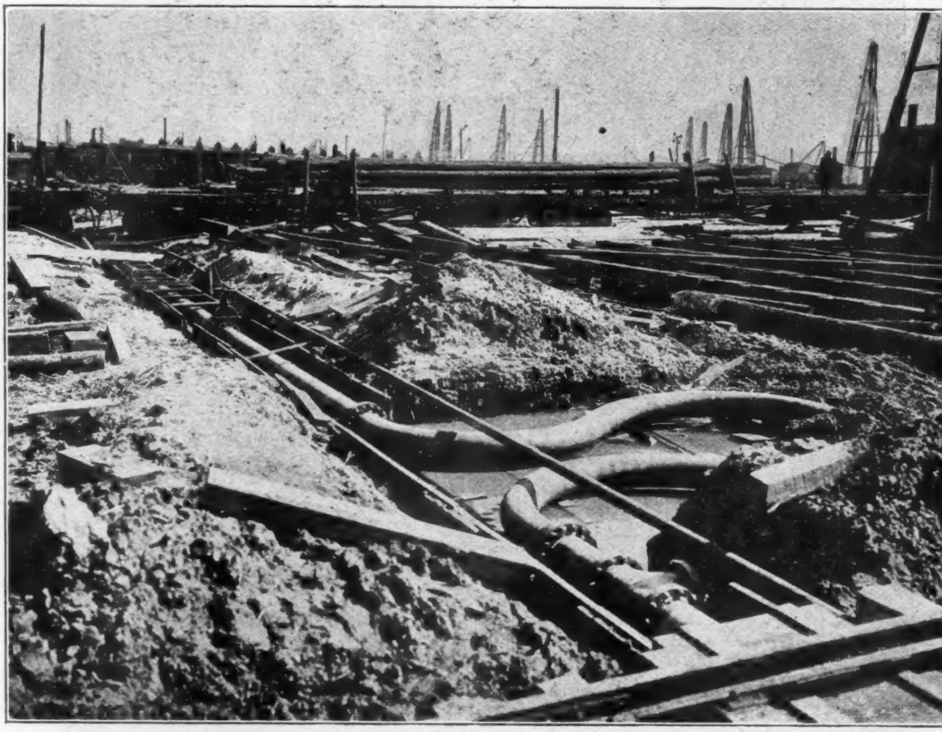
One Ingersoll-Rand Class PRE-2 Compressor 28 in. and 17½x21 in., direct connected to a 450 h. p. General Electric 4,000 volt, 3 phase, 60 cycle synchronous motor, having a speed of 180 R.P.M. The actual delivered capacity of this unit is 2,275 cu. ft. free air per minute, making the total capacity of each of the five plants 12,915 cu. ft. air per minute.

The larger compressors are equipped with after-coolers of, approximately, 1,005 sq. ft. cooling surface, and the smaller with an after-cooler of 505 sq. ft. cooling surface. One air receiver of 430 cubic foot volume, to act as a separator and to dampen pulsations, is installed for the complete plant. Each compressor is mounted on a massive concrete foundation, supported by piles.

Intake air is drawn through a wooden box intake on the outside of the building from a point above the eaves down the side of the building into cast iron or salt glazed tile pipe, cast in the concrete foundations. A suitable piping system is installed for leading the discharge air from the compressors to the receiver. It is made up of extra heavy material, using Van Stone joints.

A system of waterpiping is also installed for furnishing cooling water for the compressor jackets, inter-coolers and after-coolers, and for discharging the same into the Delaware River. Proper indicating and recording thermometers and pressure gauges are installed in the pipe lines to register the temperature and pressure of air and water. It is proposed to insert an air flow meter in the discharge line from each compressor plant, between the receiver and the 10 in. air main to register the output of the individual plants.

Installation of the compressors, and later maintenance of the same is facilitated by a 10 ton hand operated traveling crane, which spans the width of the building.

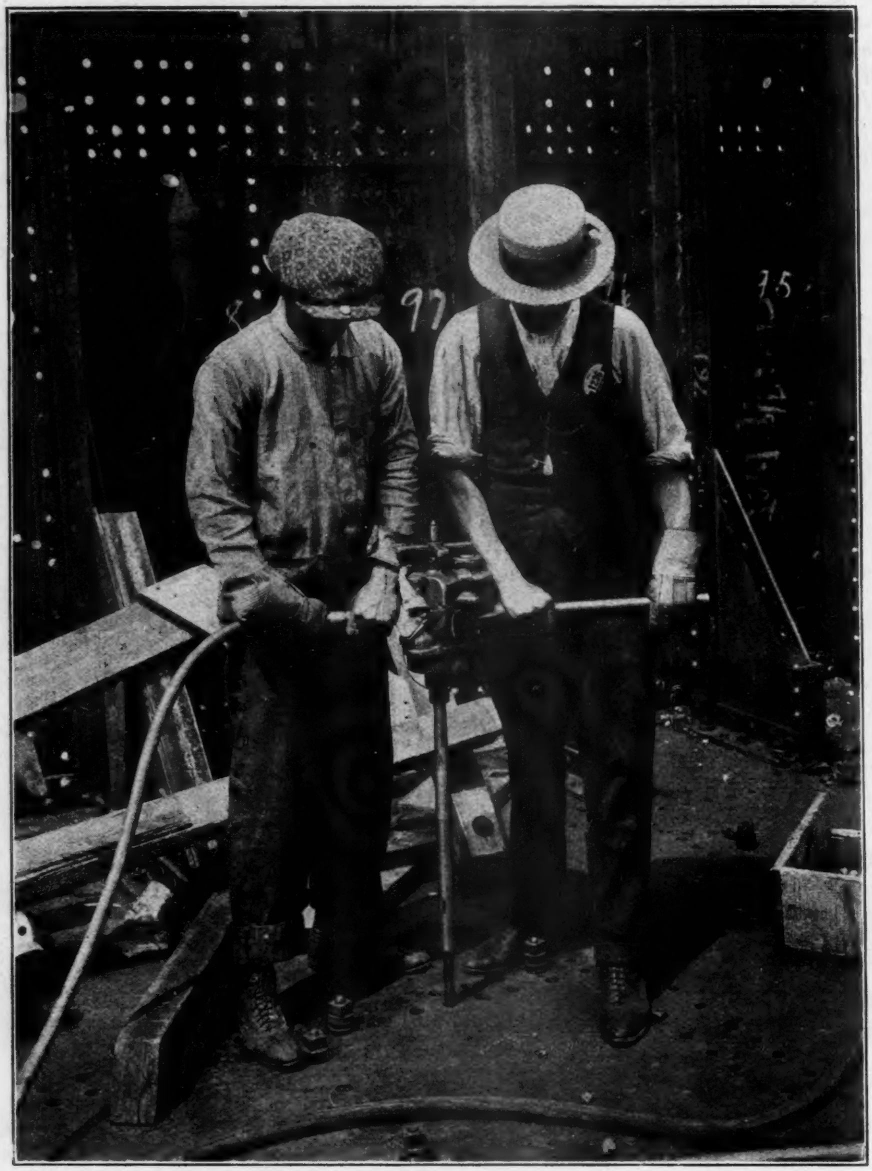


10-INCH MAIN AIR PIPE WITH U BEND FOR EXPANSION

Each compressor motor is belted to an individual exciter of 15 and 10 K.W. capacity respectively. A modern switchboard with indicating and recording instrument, is installed for starting and controlling the motors and exciters.

Remote manually controlled General Electric, type K-12 oil switches are used, being connected to the fuses through air break disconnecting switches. Double fuses and duplicate starting compensators are installed.

Two oil storage tanks of two barrels ca-



REAMING HOLES IN DECK PLATES

pacity, equipped with self-measuring pumps are installed for the proper storage and handling of necessary lubricating oil.

In addition to the five foregoing compressor plants, there are two smaller plants which feed into the 6 in. air main at the head of the Outfitting Piers, at points best calculated to serve it properly. These two plants are like the others, excepting that they contain only two of the smaller capacity compressors, making the total capacity of each plant 4,550 cu. ft. of free air per minute. The entire air compressor capacity of the combined plants is 73,675 cu. ft. of free air per minute.

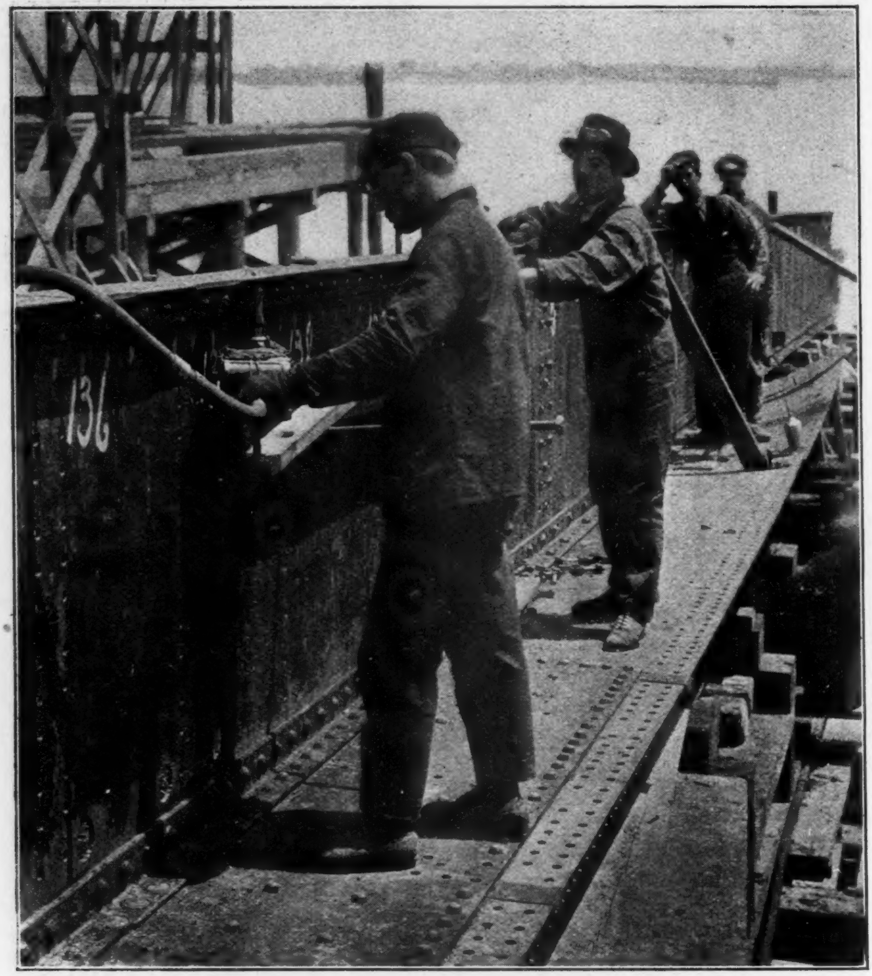
The compressor houses also are used as high voltage sub-stations, each serving demands for electric power in its immediate neighborhood. Provision has been made to

DRILLING HOLES IN BULKHEAD

enable the ready enlargement of any plant, either mechanically or electrically.

The compressor capacity installed is expected to supply sufficient air on the ships to operate pneumatic tools which have been purchased in accordance with the following schedule:

1675. No. 60 Riveters.
100. No. 90 Riveters.
1325. No. 5 Holders-on.



COUNTERSINKING HOLES FOR FLUSH RIVETS

200. No. 1 Jam Riveters.

480. No. 2 Non-reversing Pneumatic Drills.

400. No. 3S Non-reversing Pneumatic Drills.

50. No. 1B Non-reversing Pneumatic Drills.

200. No. 9 Corner Drills.

150. No. 5 Breast Drills.

100. No. 1S Chipping and Caulking Hammers.

1230. No. 2SS Chipping and Caulking Hammers.

500. No. 3S Chipping and Caulking Hammers.

50. No. 7 Grinders.

In addition to these tools, there are at present 800 rivet heating forges which operate from the compressed air lines. These forges, however, take only a small portion of the entire volume of air required for their operation from the high pressure system, and induce the rest from the atmosphere. Other equipment auxiliary to the pneumatic tools are about 300,000 lin. ft. of rubber hose, 6,500 sets of Bowes pneumatic hose couplings 150 bottom riveter frames, 15,000 rivet sets and 12,000 chisel blanks.

An air tool house has been located at the head of each group of five shipways for the storage and maintenance of the air tools. These buildings are equipped with storage

INNER BOTTOM PLATES, CAULKING A SEAM

racks for the different types of tools besides grinding and lubricating machinery.

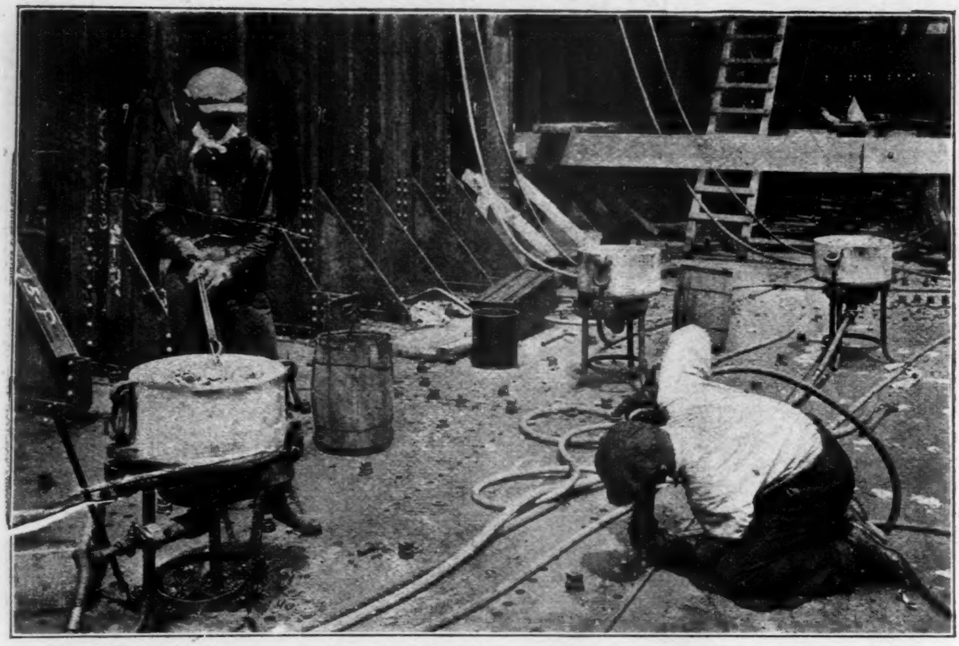
Compressed air for use in the shops is obtained from the 10 in. air main by means of 6 in. tap lines.

The Training School is equipped with one 600 cu. ft. Imperial Type Ingersoll-Rand Compressor, belt connected to a 100 h.p. squirrel cage motor. As an additional source of air supply a 6 in. pipe line is run underground making connection to the 10 in. air main along the head of the ways. A tap is also taken from this 6 in. line to the similar line feeding the Shop Group, so that the latter may get air in two ways.

The Norwegian State whaling stations have caught 200 whales but expect to catch in all 500 during the summer. The stations have orders to take care of the intestines and salt them down, as it is the intention to make gloves of them. The material is fine in every respect, pliable, soft, and exceptionally strong.

BROMINE IN THE WAR GASES

The element bromine does not occur in native form, but is derived in large quantities from natural brines. It exists in all sea water and in most mineral water and salt springs, and has been found in giant kelp (sea-weed). Bromine is at ordinary temperature a volatile heavy mobile liquid of a reddish-brown color, giving off reddish-brown vapor. The vapor when inhaled dilute resembles chlorine in smell and in attacking the throat and nose, but in addition it has a very harmful effect on the eyes. The liquid is very poisonous and produces burns on the skin. Bromine is used in many chemical reactions as an oxidizer instead of chlorine, also in dissolving gold and separating it from platinum and silver, and in manufacturing disinfectants, bromine salts and aniline colors. Perhaps the best known and most widely used bromine salts are bromide of silver, used in photography, and potassium bromide, used in medicine where it is desirable to depress the nervous system. Because



RIVET HEATER AND SPECIAL RIVETER

of its harmful effect on the eyes, nose and throat, bromine is now used in large quantity for grim purposes of warfare.

AUTOMATIC LIGHTHOUSES

During the last few years a number of new lighthouses have been built along the coast of Queensland, Australia, inside the Great Barrier Reef, and as life in the tropics is disagreeable even under favorable conditions, it was thought advisable to eliminate the human side if possible, and accordingly the Aga system of unattended lights was adopted. Acetylene dissolved in acetone at 10 atmospheres pressure is used, and there are ten cylinders, each containing 117 cubic feet, all coupled together. They are changed once a year. The light is turned on and off by a sun-valve, which is so delicate that the light has been seen to come into operation during a rainstorm. A pilot flame is always burning. The lights are of 1,500 candle power, with a visibility of 13 miles. So far—*i. e.,* since 1913—no trouble has been experienced with any of those unattended lights. The first cost compares favorably with that of a manned light, and the running cost is only about one-twentieth.

RUSHING A BRITISH SHIPYARD

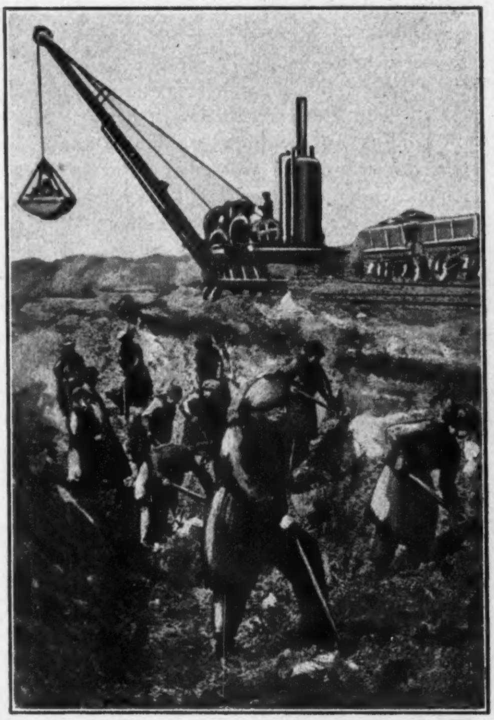
When the history of the efforts made by British shipbuilders to increase the output of vessels to make good those lost by submarine attack comes to be written, few achievements will take a more prominent place than that of the Furness Shipbuilding Company, which has transformed within the space of a few months a site of ninety acres "somewhere on the North-East Coast" from grass land to a fabricating shipyard with four keels laid on the blocks.

In the middle of March of this year, horses and cows grazed on the site of what is now a shipyard. Permission had been given to the company to proceed with the work at the end of last year, and the intervening time had been occupied in preparing and digesting the plans of the undertaking. Then one morning the horses and the cows disappeared and their places were taken by gangs of workers whose aim was to show that a British yard with eight berths could be built and equipped in from eight to nine months. The feat was by no means easy. The selected site was below the level of the river at high tide. Before a ship could be launched, the whole area had

to be raised by some 12 ft. or 15 ft., but the builders of the yard were confident that the task could be accomplished, and accomplished too, to a prepared schedule of time. Events have justified them in their optimism. Whenever a date was set for the accomplishment of a task, that date has been strictly adhered to.

The work was begun in March; the middle of July finds four of the eight berths already in use, and the concrete bed of a fifth well advanced. From the outset, the one object of everybody has been to save time. Those in authority solved that problem by never leaving the work for weeks together; they worked in railway carriages; they took their meals in railway carriages; they slept in railway carriages; and they were always at hand to face any emergency. The problem of feeding the 2,000 workers had to be tackled. In eleven days a canteen was built, and though on the eleventh day there were no windows and no roof; a three-course dinner was served to the workmen.

WOMEN HANDLING SHIP MATERIAL



WOMEN DIGGING A SHIP BASIN

WOMEN ON THE JOB

Whenever a difficulty arose it was dealt with immediately. A large body of the men was suddenly absent from their work; the next day their places were taken by women, who have worked splendidly ever since. Then the management found that there were far too many cases of sprained ankles among the women, who used to arrive at their work in high-heeled boots and shoes. A standard boot was designed, and sprained ankles are no more. These are trifling matters, perhaps, but they help to explain why the building of the yard is now proceeding with clock-work regularity.

The new yard is situated on the bend of a river, and the eight slipways can take vessels up to 650 ft. long, which will be launched down-stream. For the present only "fabricated" ships of standard pattern are to be built, the parts being made, as a general rule, at the steel works which abound in the immediate neighborhood. The steel as it arrives is dumped down on a spot on which a few weeks ago there was a mountain of slag. The con-

tents of the latter is being used to raise the ground to the necessary level, a work which proceeds at a remarkable pace. As each section is completed it is handed over to the builders to begin the erection of the berths.

Standing on the high ground by the river one can watch the whole work in progress. At one end the grass is still growing, for the ground has scarcely been touched. A little farther on the land is being filled in by women workers, and elsewhere other women are at work on the site of a wet basin which, when finished, will be able to take several vessels simultaneously for the fitting of the engines and boilers. On a slipway, where the bed for the keel blocks is rapidly nearing completion, girls are helping at the large concrete mixers; at another berth the keel has already been laid, and the riveters are hard at work, while at the two farthest slipways the centre keelsons are in position, and electrically driven cranes are bringing up the fabricated parts. In the background are the ambulance station, the general offices, consisting of two rows of railway carriages, and the canteen, while the foundations of a number of model cottages for the use of married workers and of a hotel which will accommodate 1,000 men are also visible.

As to the capacity of the yard, the idea is that a ship a fortnight shall be built, and when the yard is in full operation the management is convinced that this output is possible. If all goes well the first fabricated ship will be launched in November, and thereafter it is hoped that a new hull will be put into the water ever two weeks.—*The Engineer*, London.

TRICKS AND ACROBATICS IN AIR FIGHTING

Were speed the only criterion by which to judge the most likely winner of an aerial combat, then the aviator mounting the fastest machine would always be the victor. And that is as much as to say that the Allied aviators would always win, because of late their machines are almost always faster than the German ones. But speed and climbing ability are only two factors in aerial combat; besides, there are markmanship and maneuvering skill. It is safe to say that the last-mentioned factor, maneuvering skill, is by far the most important in aerial combat. Both when on the offensive and on the defensive the aviator who knows every trick of his profession stands the best chance of winning or escaping.

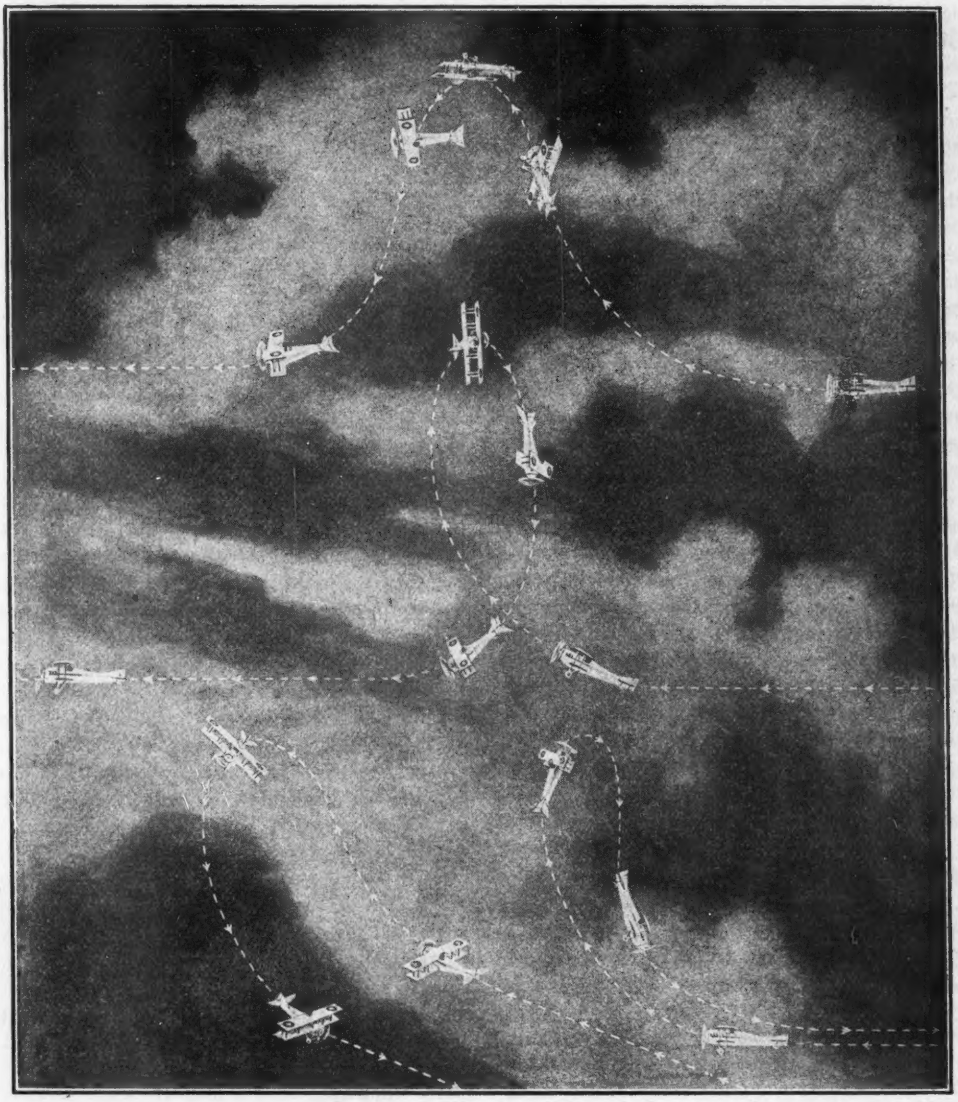
It is due to the fact that tricks are an indispensable part of the air fighter's training that only the best of aviators are chosen for combat work. Indeed, as the training progresses from the safer to the more dangerous trick machines, more and more students drop out and are used in other branches of the air service, such as for reconnaissance and bombing work. The pick of the men—the daredevils, if you please—remain.

In the French flying service the combat or *chasse* pilots are sent to a finishing school at Pau, after graduating from preliminary flying schools. At Pau, under the direction of none other than Lieut. René Simon, who will be recalled as the daring exhibition flier of the early days of aviation in the United States, the pilots who have already mastered flight on slower mounts are put on diminutive but speedy Nieuport biplanes. From the Nieuport with a wing area of 18 square meters, the pupil advances to the 15-meter and finally to the 13-meter. Needless to say, the diminishing wing surface makes for greater speed, but at the same time the machine becomes more difficult to fly because of its poor gliding qualities. Such a machine lands at a terrific speed, and not as the larger planes which can volplane gracefully with their motors barely turning over.

Individual instruction is given at the Pau school of aerial acrobatics. Lieut. Simon explains the "stunts" one at a time to each student who must repeat the instructions until every movement is committed to memory. Then the student takes the air with his diminutive biplane and performs the "stunts" with the instructor and other pupils watching on.

Now the greatest of all "stunts" appears to be the so-called "vrille," which is a sort of twisting or corkscrew tumble as of a machine falling out of control. It used to be the practice to teach the "vrille" last, but now it is taught first. For once the student has tried to master the "vrille" he no longer has fear for other "stunts."

To make his first "vrille," the student ascends to a height of over 800 meters and after flying on a level course for a short while, he switches off his engine and at the same time pulls the control stick back towards him and



SOME AEROPLANE STUNTS

towards one side, while pushing on the rudder bar either right or left with his feet, depending on which side the control stick was directed. As a result the biplane swoops upward, loses its speed, stalls, and then falls over to one side with a twisting or corkscrew movement like a falling leaf. The sharpness of the movement can be varied according to the rudder pressure being utilized.

To come out of a "vrille" the pilot replaces his control stick in the center position and brings the rudder bar back to normal, and then pushes the control stick forward a few inches. The machine soon ceases to corkscrew, points forward, and dives straight down. It is then by reversing the control stick that the pilot brings the machine to an even keel again and switches on the engine. The "vrille" is done to the right and the left, while the ever-watchful Lieut. Simon waits for the pilot to land, in order to comment on the performance. Only one machine is in the air at a time.

The "renversement" comes after the "vrille." This trick is a change of direction without

loss of height and, in the case of a skilled pilot, without reducing speed. The pilot ascends to above 800 meters and after flying on a level keel for a few minutes, he points the machine slightly down so as to bring the speed up to maximum. Then he brings the control stick back about half way and reduces the motor speed in order not to perform the "stunt" too rapidly. Then, when the machine appears to lose some of its speed the rudder is turned sharply to one side and the machine immediately falls to that side. When in the vertical position the airman brings the rudder to the center position, opens the engine wide, and returns the machine to a level keel. It will be noted that in the "renversement" the ailerons are not employed, as contrasted with the "vrille."

When being pursued a pilot sometimes resorts to the trick known as the "changement de direction" in French aviation circles. As in the instance of the "renversement," this turning maneuver can be executed without loss of speed or height. In describing this "stunt" in a recent issue of *Flying*, Lieut. Granville A. Pollack, U. S. A., late of the Lafayette Corps, states that it is a valuable but rather rare maneuver.

Flying level at full speed, the necessity to return suddenly is met by throwing the control stick very quickly to one side, as far as it will go, and then immediately pulling hard back toward the pilot, accompanied by a very slight pressure of the opposite foot and only just sufficient to hold the tail level, or it will be inclined to fly forward. The result is very startling for the first time, for the pilot feels as though he were being forced through the seat, so strong is centrifugal force acting, yet in reality he makes a comparativly wide bend, not unlike a hairpin. This "stunt" is also done three or four times and either to the right or to the left, at the acrobatic school for airmen.

A wing slide follows, which is done by throwing the control all the way to one side, and accompanying it by pushing the opposite foot sharply ahead, sufficient to hold the nose of the machine up, and at the same time slightly pushing forward the control stick, which gives the effect of traveling on the "outside" of the circle, and the machine descends sidewise at a terrific speed, much faster than it goes ahead, but with the pilot following practically a straight course forward.

A fifth trick, that of "retournment," is performed, very similarly to a "renversement," but instead of coming out in the opposite direction the movement is continued until one is again on the original course To commence, the pilot does as in the "renversement," pulling the control stick back, the machine mounting sharply, and giving the rudder a kick. Then the tail goes up as the machine starts to fall to one side; but now, as the position approaches the vertical, the foot is only partly recovered, while the control is pulled moderately to the same side, as used by the rudder, which produces a half spin sufficient to bring the machine back to the former direction. It is important that the aileron should be used here, for if the rudder alone is used the movement will be too slow to be of value in a fight, and will result in loss of considerable height.

Here it should be understood that, when done properly, all these maneuvers, excepting the wing slips, should be done without appreciable loss of height, and therefore quickly; and so as an indication of the development of a pilot's "reflex," aerial acrobacy is beyond doubt conclusive evidence.

Last, and by far the most difficult to execute, is the horizontal "vrille" or barrel roll, as it is often called, which is very spectacular but the use of which in combat is questionable. This is usually started by slightly reducing the speed of the engine, pulling the control stick well towards the pilot, and giving a very quick push at the rudder—to the full extent, in fact—and at once replacing all controls in the center. The machine starts to mount suddenly, but the full effect of the rudder swings the machine up on one wing, over complete sideways, which follows with a wing slip and a flattening sidewise. The whole presents a most striking effect, and unless the pilot is quick it generally results in a loss of speed and a "vrille."

Looping is not encouraged in military aeronautics, for the reason that as long as the machine is inverted the pilot is helpless and presents a good mark to his opponent. Furthermore, the machine guns are apt to jam as a result of the maneuver.

A "stunt" frequently employed at the front is the upward swoop followed by a tail slide. When a machine is being pursued by another

which is blazing away at the tail of the first, the usual maneuver for the first pilot is to pull the control stick backwards, heading his machine straight up until it attains a vertical position. Here it "hangs" by its propeller for just an instant, as is strikingly shown in our cover sketch, when it slides back and is finally brought into the level position again. Now it is behind the opponent and possesses the advantage.—*Scientific American.*

COMPRESSED AIR TO WIN THE WAR

By Frank Richards

Concluded from page 8871

And yet compressed air will not do everything; and this begins a story very different from that we have been rehearsing. It was demonstrated a score of years ago, to the satisfaction—or the dissatisfaction—of everybody interested, that compressed air can never be a success for driving street cars. We must not forget, however, that there are lots of compressed air mine locomotives giving good satisfaction. One of the later and decisive demonstration failures of compressed air street cars, which took place in New York, was really a prelude to a great success in another direction, and, as may appear, a long-distance shot at the Kaiser and his crew.

LIQUID AIR

The failure of the compressed air street cars in New York threw a three-stage, high pressure air compressor out of business, and permission to use the compressor gave Chas. E. Tripler his opportunity to be the first to show the world that liquid air can be produced on a practical commercial scale.

It has never been clear to the world how Tripler got hold of the trick, for he had none of the qualifications which might have been presumed to be indispensable, and his inability to follow up the matter was pitifully exhibited; but he did make liquid air accessible to experimenters in various colleges and elsewhere, and its peculiar properties came at once to be generally familiar; but for a time it was a curiosity only, and no one could suggest to the world what to do with it, so Tripler did not realize a fortune.

Liquid air, however, at the time of the Tripler performances was really in the hands of most capable scientific investigators and experimenters, and under their direction and by the aid of processes which seem simple enough in the telling, but which require intricate apparatus and precise manipulation under careful supervision to produce the desired results, the production of liquid air now gives the world its working supply of oxygen.

INDUSTRIAL OXYGEN

For the liquefaction of air there are two imperative conditions, the most important being the reduction of temperature. The air *must* be cooled to at least—220 degrees F, that is 220 degrees below zero, not a degree less, and to liquefy the air at this temperature great pressure is required, so the air compressor is the supreme essential for the entire operation. The process crudely consists in compressing air to a high pressure, cooling it as much as possible by ordinary means and then allowing a portion of it to re-expand, this expansion of the air reducing its temperature still more, as had been found in rock drill tunneling experiences. The air thus cooled is used to cool another portion of compressed air, allowing it to expand and become still colder, this process being successively repeated until the air becomes so cold that the liquid air begins to form. It takes a large volume of air for a small quantity of the liquid, the ratio being about 800 to 1, but with sufficient power and continuous operation liquid air is produced in great quantities.

The ordinary air of the atmosphere may be said to be the steam of liquid air. The liquid if not thoroughly heat-insulated boils away very rapidly, the boiling point at normal pressure being 312 degrees below zero, or 524 degrees below the boiling point of water.

THE SEGREGATION OF THE OXYGEN

If the temperature of the liquid air can be so controlled as to allow it to boil away slowly a curious thing occurs, for which we may be thankful. It happens that the boiling points of the two constituent gases of the air, oxygen and nitrogen are more than 20 degrees apart, and so the nitrogen will boil away first and leave the oxygen, which then may be separately collected. The actual process employed, as previously suggested, is extremely complex, but the principle of the operation is here sufficiently indicated. And here we have the source, through compressed air, of the world's supply of oxygen for industrial and other purposes. Oxygen compressed in steel bottles is

now common merchandise and procurable everywhere.

The demand for oxygen thus produced is already enormous. Before this war began one producing company in Great Britain with eight plants in the larger cities had an aggregate output of about half a million cubic feet of oxygen per day, and in the United States the business exceeds this several times over both in the number of plants and in the daily output.

REPAIRING THE GERMAN SHIPS

One of the most wonderful results of this ready and plentiful supply of oxygen has been the development and wide employment of the Oxy-Acetylene process, and of other processes closely allied, for the cutting and welding of metals. By this means an intense heat is quickly produced which can be locally concentrated and directed with minute precision, cutting accurately to line when that is required, and with equal facility uniting metals by welding with practically no limits as to the magnitudes involved.

In this line of work the electric arc is equally ready and effective, and these two ready agencies provided a grand surprise for the cunning German tricksters and a most welcome bit of help for American schemes. The final recognition of war conditions by the United States found interned in American harbors a great number of the biggest German liners which had been employed in the Atlantic carrying trade. When war was seen to be inevitable the crews of these vessels had time and clear opportunity to so mutilate the machinery and so disable the ships for service that an incalculable time would be required for their restoration. They seem to have gone to the limits of their ingenuity, but their foresight was defective.

Their mutilating operations were naturally chiefly upon the engines. The favorite trick seems to have been to break a piece out of the main cylinder or other most ponderous and responsible casting, the assumption being that the entire member would have to be removed and replaced, the latter perhaps an impossibility except where the engines were built.

These breakages and other disarrangements merely provided such jobs as the electric arc and the oxy-acetylene jet are constantly aching to get hold of. Under experienced direction all the breakages were quickly repaired in place. Parts broken out were welded into place again. Parts which could not be found were made in the rough, welded into place and then dressed and trimmed accordingly to requirements. The detailed story of these repairs will be choice reading for engineers and mechanics at a later day.

The ships were completely repaired in months instead of years and put immediately into active service. The largest passenger carrying steamers have been making trips which are time records and carrying soldiers now counting up into the millions. These ships have been doing this months and months before the Germans—and even ourselves—could have expected them to be ready.

COMPRESSED AIR RELEASES LAKE STEAMERS

There was another valuable service rendered closely akin to the preceding and aptly illustrating the dual facility of the oxy-acetylene process. A considerable number of big steamers doing business on the Great Lakes were desperately needed for the Atlantic service, but were unavailable because they couldn't get out. They were too long to pass through the canal locks, and that settled it. Compressed air settled it the other way. Oxy-acetylene, the ambidextrous offspring of compressed air, cut the ships in two, and when they had passed the locks and reached tidewater welded them together again as good as new, and immediately ready for the carrying of munitions and supplies.

COMPRESSED AIR BUILDS SHIPS

Perhaps we should speak now of the so-called pneumatic tool and what it is doing. This is an air operated tool closely allied to the rock drill, but differing essentially in the principle of operation, and having a wider variety of adaptation, so that it is now much more numerously employed. It represents and takes the place of the once familiar hammer and chisel of the machinist, its initial typpical operation being the chipping of metal. It strikes blows harder than would be struck by hand and at speeds up to a thousand a minute. It is at home with and applicable to all the operations for which the hand hammer has formerly been employed. It is the great riveting tool, the sole reliance now of boiler makers, structural iron workers and shipbuilders for that essential operation. In shipbuilding it is the tool supreme, so essential, and the output of the shipyards so dependent upon and so

determined by the speed of its performance, that great rivalry in the making of riveting records has developed in the various shipyards. For the surprising and most gratifying rapidity with which the new ships are being splashed into the water the riveters and other pneumatic tools are to be thanked.

And the story applies now almost equally to the building of the wooden ships as to those of steel. Pneumatic tools are relied upon to do all the boring, the adzing, the planing of surfaces, the calking of the seams, the painting.

COMPRESSED AIR IN THE TRENCHES

Pneumatic tools have developed into successful rivals of the rock drill and have largely supplemented it in its special line of work. The rock drill is heavy in itself, and with its tripod, or the bar, or the column upon which it must be mounted, requires always two men and often three for its proper handling, to say nothing of the time consumed in pulling down and setting up. The hammer drills, as they are called, are one-man drills, easily held. at their work and requiring no waste of time between the completion of one hole and the beginning of the next. They also require not more than one-half the volume of air to keep them going. The fatigue of the single operator also is reduced and these drills have rapidly become the favorites.

It is well known that the trench work in France often involves the cutting of rock, not only in the driving of the open trenches but in the dugouts and passages requiring overhead protection, also in the countermining and tunneling schemes which are a part of the trade of war, and practical miners are always in great demand. Such work may be ordered with great suddenness and must be pushed as if a matter of life or death, which, indeed, it is, and in anticipation of such demands hammer drills by the ten thousand are in the army equipment, with air compressors literally by the thousand in easily portable units and usually gasoline-driven to supply the demand which never ceases.

Where the opposing trenches are near each other, with troops on the alert, the throwing of grenades occurs at every opportunity, and for this service air is not only quick and ready if the supply is constant, but projects the missile with the direction and precision unequaled by any other means. Air horns are in use along the lines capable of shrieking sudden alarms to be heard a mile, and for this also if for nothing else the air must be always ready.

COMPRESSED AIR ON OUR WARSHIPS

Whenever our warships are mentioned we think at once of the big ships and the big guns they carry, forgetting the little ships and the boats that can hardly be called ships at all, but which night and day are on the alert and doing the real active work of the war. This is in no way to belittle the standing menace and terror of the big ships whose mere existence is sufficient to overawe and keep in hiding the great German fleet. But the real active work that tells is being done by the little ships, and in all, big or little, compressed air plays its part. On the big ships it raises the ammunition to the guns and does various lifting jobs and is always ready for the pneumatic tools in engine and boiler room which have frequent employment. It is used for the refrigerating medium, as much safer than ammonia in case of accident. But especially is it the vital agent in the manipulation and equipment of the torpedo.

COMPRESSED AIR SUNK THE LUSITANIA

The mention of the torpedo at once brings us to the U boat as the culminating example of the power and effectiveness of compressed air in the present war. The U boat is simply the elusive conveyor of the torpedo. That is really its sole weapon of offense, and without the torpedo there would be no U boat. The compressed air trick of submergence and reappearance at will is accomplished by mechanical compressions and reexpansions, but those functions are negligible as compared with the action of the torpedo itself when pointed for its prey and scooted out on its course. When released the torpedo is at once entirely a compressed air creature. Air alone drives it on its deadly mission and without the air it would be inert and harmless. Compressed air drove it to smash the hull of the Lusitania, as air has supplied the motive force for its every murderous stroke.

When the U boats began to swarm it rather knocked the breath out of us, and we could not be expected to recover all at once. What emphasized it worst of all was the apparently hopeless onesidedness of it. Submarines could make a big show so easily, for their targets were everywhere, while we, if we had been ever so ready could not have found anything to hit, for German ships had already been swept from the seas.

The records show more and more that the situation is by no means so hopeless, and it is becoming a case of diamond cut diamond, with a heavy preponderance of diamonds for the Allies. If the U boat can destroy by means of the torpedo it can be, and is being, destroyed by the torpedo—compressed air on both sides. We have been late in getting there, but we are onto the job. Not to mention our submarines, whose numbers are not advertised, with our torpedo-equipped destroyers and chasers outnumbering the U boats twenty to one, the game cannot but be a losing one.

And then we have a new compressed air device that is beginning to show what it can do—by doing it. This is the compressed air mortar for throwing the depth bombs. It of course does not operate at long range, but when it gets its chance—and it is instantly ready—it places the bomb in precisely the right spot and gives it the essential drop, nearly vertical, which cannot be accomplished by a gun.

The records of the destruction of submarines are in most instances difficult to verify, for when one disappears it may or it may not be the last of it. We know that the building of submarines has been pushed as the supreme ultimate hope of the Kaiser, and yet their numbers do not increase and their telling strokes become less frequent.

We were speaking above of the onesidedness of the U boat activities. It is a onesidedness of malignity without the suggestion of any mitigating circumstances. The function of compressed air, aside from the U boat torpedo, would seem also to be onesided, but its onesidedness is all beneficient. It helps in all directions, but what is there to help *it?*

It not only is the most indispensable agent in the providing of all the raw materials which come from the rocks, but it is equally helpful in the subsequent processes of manufacture. At the blast furnaces, for instances, which convert the ore to iron or steel, compressors—not blowers—are employed of 50,000 cubic feet per minute capacity or more, while the compressor units at the mines average only 2,000 or 3,000 cubic feet per unit.

A considerable number of compressors are now used at the oil wells simply to deliver large volumes of high pressure air deep down into the wells and largely increase the flow of oil. In the natural gas industry the services of compressors are now of great importance. The value of the annual product of natural gas in the United States, by the way, is more than 25 per cent. greater than that of gold. Where the gas is transmitted for long distances and loses its pressure as it flows, compressor plants are installed to recompress the gas so that it may flow to and be delivered at a much greater distance. Compressors also are largely employed in the compression of gas for the extraction of gasoline, this being now a considerable item of our national supply, and a direct contribution to our war waging resources.

It is the same story all through, as in small things so in the biggest, even to the winning of the great war, compressed air can be only and altogether helpful.

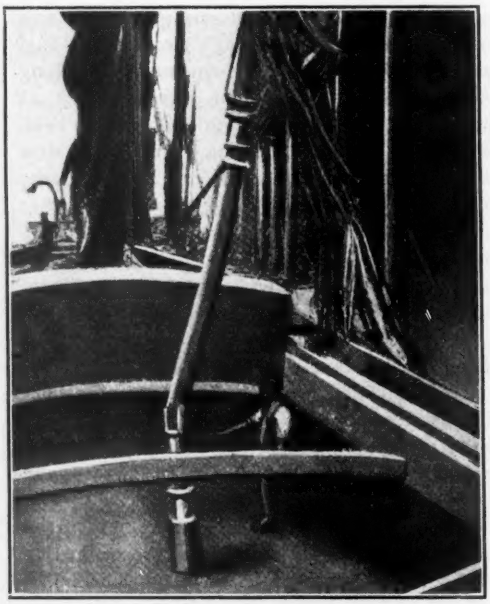


FIG. 1

A PORTABLE PNEUMATIC GRAIN UNLOADER

The apparatus here illustrated is, in the details at least, a development of the war, as it was built to the instruction of the British Office of Works, the illustrations and the description, with some modification, being reproduced from a recent issue of *The Engineer*, London. The principle of operation here employed should be familiar enough to our read-

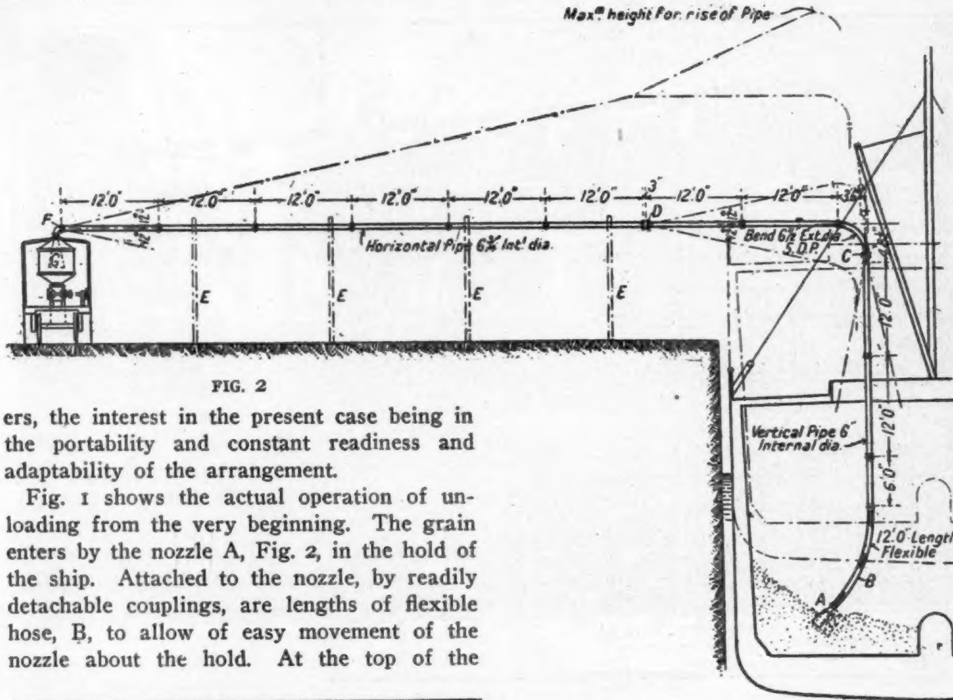


FIG. 2

ers, the interest in the present case being in the portability and constant readiness and adaptability of the arrangement.

Fig. 1 shows the actual operation of unloading from the very beginning. The grain enters by the nozzle A, Fig. 2, in the hold of the ship. Attached to the nozzle, by readily detachable couplings, are lengths of flexible hose, B, to allow of easy movement of the nozzle about the hold. At the top of the vertical portion of the transport line is a ball joint C enabling the whole of this portion of the line to be swung in any direction, thus increasing the surface that may be covered by the nozzle. Adjacent to the edge of the pier, alongside which the ship is moored, is a second ball joint D, the object of which is to allow the end sections of the transport line to be raised or lowered to accommodate varying levels of grain in the hold. The transport line consists of 12 ft. lengths of pipe as shown, joined together by couplings designed to facilitate the work of erection and dismantling. The whole line is supported on trestles E. In order to provide for differences of level between the trucks and the edge of the pier, a third ball joint F is fitted at the near end of the line where it enters the receiving truck. This joint allows the pipe line to be swivelled in a horizontal plane so that the truck need not be exactly opposite to the hold to be unloaded. It will be seen that the whole arrangement provides such adaptability in the transport line that any combination and conditions may be met. Illustrations of a nozzle are given in Fig. 3. The small door shown is opened

FIG. 3

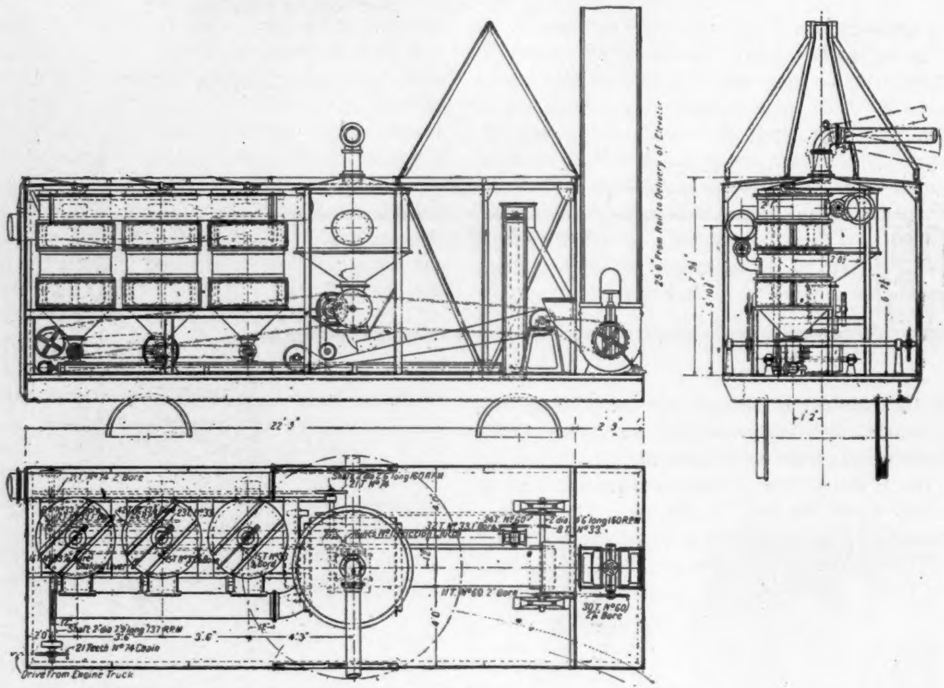


FIG. 4

whenever a block occurs in the pipe, thus admitting air freely above the grain and getting rid of the obstacle.

The grain drawn from the hold enters through the roof of a large receiving chamber on the filter truck, shown in Fig. 4, and by the reproduction of a photograph in Fig. 5. The air moves through this chamber at such a speed that it will no longer carry the grain, which accordingly falls to the bottom, where it enters an apparatus called a discharger, consisting of a bucket-wheel rotating inside a closely fitting casing. Its purpose is to discharge the grain while preventing an inrush of air into the receiver. Thence the grain passes down a shoot to a short band conveyor which delivers it into the boot of the elevator shown at the end of the truck. This elevator is arranged to deliver into the existing weigher trucks at the various docks, when it is automatically weighed and sacked up for delivery. The elevator can be readily dismounted for transportation in ordinary railway wagons. As the bucket wheel is rather liable to become blocked by foreign bodies such as bolts, pieces of wood, etc., becoming jammed between one of the vanes and the casing, a friction clutch is introduced in the drive, which slips in case too much resistance is met with.

The air leaves the receiver by the large horizontal pipe shown to the right of the end view, but not seen in the photograph, and passes to the three filters. These filters consist of a nest of closely woven canvas tubes, through which the air must pass on its passage to the blower. The dust is deposited on the inside of the tubes, which have to be cleaned periodically by a shaking mechanism. Valves are fitted in the inlet and outlet pipe of each filter, enabling any one to be cut off from the rest of the system when it is necessary to shake and clean the tubes. It has been found necessary thus to isolate the filter from the current of air when being cleaned, for otherwise the dust is not removed from the pores of the cloth. By the use of two, or, as here shown, three filters, each fitted with its own valves, it is possible to effect the cleaning without stopping the working of the plant. The dust removed falls into a chamber below the filters and is passed out thence by means of small bucket wheels, and falling into a worm is carried underneath the truck and passed to a small auxiliary elevator which returns it to the grain. It seems an absurd pro-

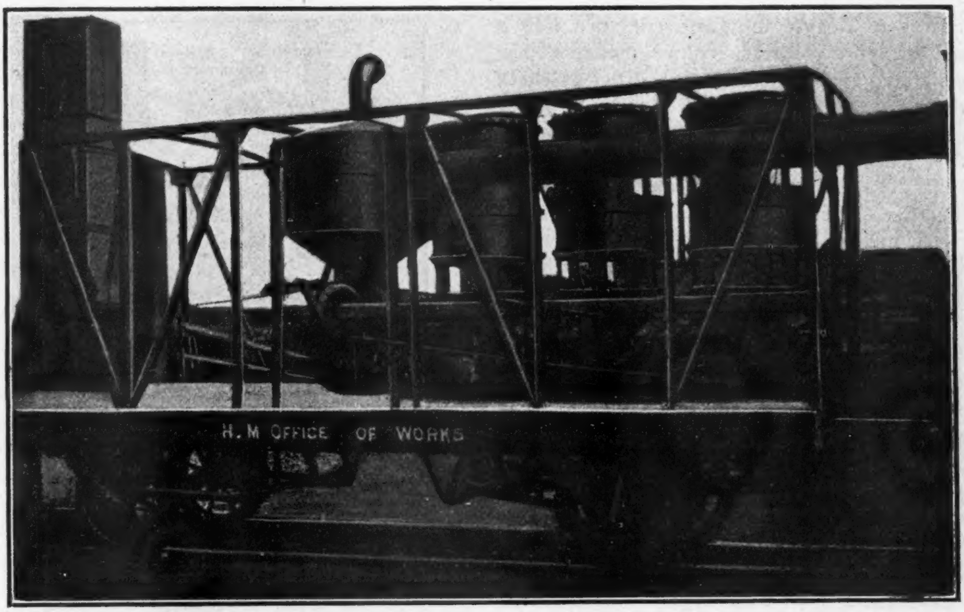

H. M OFFICE OF WORKS

FIG. 5

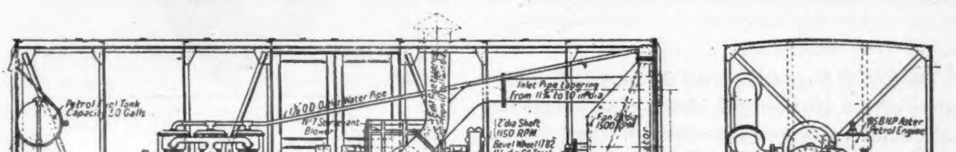

Petrol Fuel Tank
Inlet Pipe tapering
From 11½ to 10 in dia
1½ O.D. Outlet Water Pipe
Blower
2" dia Shaft
1150 RPM
Bevel Wheel 17.82
PL dia 64 Teeth
Pinion 4.465 PL
dia 16 Teeth
Radiator
1½ O.D. Inlet Water Pipe
Exhaust Silencer
Cross Section A B.
Removable Cone
Radiator
Exhaust Pipe
Inlet Pipe
Cross Section C.D.
25'0" Inside Truck
A.
C.
Inlet Pipe
No 7 Sturtevant
Blower
C L of Blower
Petrol Fuel Tank
85 B H P Aster
Petrol Engine
2" dia Shaft 288 R P M
B
D

FIG. 6

cedure to cleanse the grain and then foul it again, yet merchants require that the dust separated shall be returned in order to check their shipping weights.

The air, freed from dust, passes from the first truck to the second by the pipe seen in Fig. 5. This pipe has a flexible connection in order to accommodate varying lengths between the two trucks, and also to avoid damage from shock, say during shunting, and to allow the trucks to stand on a curve.

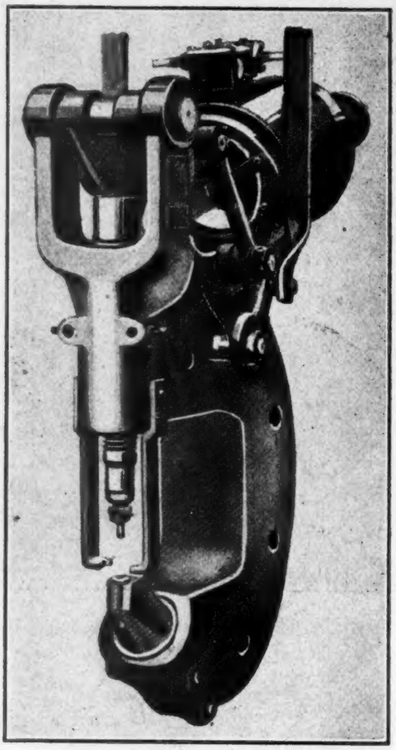
The second truck is also shown in Fig. 6. The rotary blower which exhausts the air is driven by an 85 horse-power Aster engine, through spur gears, enclosed in a gear case with an oil bath. Countershafts, driven by gears, with a chain connection between the two trucks provide the motive power for driving the grain discharger, the three dust bucket wheels, the dust worm, the band conveyor and the two elevators.

The official trial was conducted at Ipswich, when, by courtesy of Canfield, Limited, a cargo of wheat was discharged from the hold of an eighty-ton barge into a receiving elevator of their mill.

The barge lay alongside the pier at a distance of 100 ft. from the elevator, the portable horizontal transport line being carried along the columns on the pier side, about 20 ft. above the grain in the hold. The plant was started up for a short preliminary run to effect adjustments necessitated by the class of grain to be handled; the capacity averaging 23 tons per hour and ran up to 32 tons per hour, at which point the plant was stopped. After an interval the trial proper was run, the average and maximum capacities attained being 27 and 33 tons per hour respectively—the guaranteed capacity, at the maximum distance of 100 ft., being 25 tons per hour. The area of the hold being great in proportion to the depth, made it unfavorable for obtaining a higher average. An excessive amount of dust also was present.

SHIPYARD RIVETING AND PUNCHING MACHINE

The illustration on this page shows a riveting and punching machine of special type which has been designed for shipyard use by the Hanna Engineering Works, 1765 Elston Avenue, Chicago. It may be remarked that



PNEUMATIC PUNCH AND RIVETER

the machine is heavier and more powerful than a casual glance at the picture might suggest. In addition to driving rivets 1 in. in diameter with a single stroke of the air piston the machine also can drive a punch which will cut holes of the same diameter in 5/8 in. steel.

The machine follows the builder's standard type of construction for riveting machines and uses a combination toggle and lever action which is relied upon to upset the rivet completely in the hole, thus forming a tight head and following the shrinkage of the rivet with the full rated pressure of the machine until a set is secured. The toggle action, it is explained, builds up the pressure at the dies during the first half of the piston stroke and then merges into a combination toggle and lever action which is relied upon to maintain the toggle alignment and pressure while the die travels through the final half of the stroke.

To facilitate the punching operation a dashpot mechanism is provided which takes up the forward thrust of the plunger when the punch shears through the material. A forged

steel nose or lower stake which can be readily removed by loosening the set screw holding it in place is provided. This nose is relied upon to enable the operator to work in very close sections such as bulb angles and bent ship channels. The machine being normally used in suspension the pivots of the sling are so located that the machine is balanced and can be inclined to any angle the work may require.

NITROGEN FROM THE ATMOSPHERE

The largest experimental plant in the United States for the manufacture of fixed nitrogen from the air, with the exception of the ones now being constructed for the War Department is in operation at the Unietd States Department of Agriculture Experiment Farm, Arlington, Va. At this plant the nitrogen from the air is combined with hydrogen to form ammonia which can be used in the manufacture of explosives and fertilizer. Experiments are now being conducted at this plant by the Bureau of Soils with a view to increase the efficiency of the process. The War Department is co-operating in this work. What is known as the Haber process of nitrogen fixation is being used. This process involves the production of ammonia from hydrogen and nitrogen. The two gases are mixed in the proper proportions, put under high pressure, subjected to intense heat and passed over spongy iron, whereupon a portion of the mixture combines to form ammonia.

GERMANY'S DESPERATE ACTIVITY

The output of ammonia by the fixation of nitrogen from the air has grown to very large proportions in Germany since the war started. According to the London *Iron and Coal Trades Review,* the production of ammonia in Germany by the Haber synthetic process, according to a German daily paper, rose from 30,000 tons in 1913, to 60,000 tons in 1914, to 150,000 tons in 1915, and 300,000 tons (estimated) in 1916. An output of 500,000 tons of ammonia was anticipated in 1917, containing 100,000 tons of nitrogen; at the same time 700,000 tons of sulphate of ammonia (140,000 tons of nitrogen), and 400,000 tons of calcium nitrate (80,000 tons of nitrogen) was expected to be produced, the total containing 320,000 tons of nitrogen, which exceeds by 100,000 tons the entire consumption of nitrogen in Germany in 1913.

FUNCTION OF AIR IN COMBUSTION

A bunsen burner can be used to show how mixing air with a flame affects combustion. When the air supply is turned off the flame from a bunsen burner is luminous. Its luminosity is due to incandescent particles of solid carbon resulting from the decomposition of hydrocarbons in the gas. The interior of the flame contains no oxygen to burn the hydrocarbons, and they are decomposed by heat into hydrogen and carbon. When the air is mixed with the gas as it enters the burner, the flame is nonluminous and has a well-defined inner cone. In this inner cone the oxygen of the air combines with hydrocarbons of the gas, producing H_2 and CO, which burn on the outer envelope of the flame. The reactions in the presence of oxygen produce gases that are easily burned, whereas the carbon produced in the absence of air is difficult to burn. Similarly, air mixed with volatile matter in the furnace before the tar is decomposed by heat may produce a larger proportion of combustible in the form of gas and less in the form of carbon.—*Bureau of Mines Bulletin No.* 135.

HIGH SPEED RIVETING RECORDS

The following from *Engineering Fleet News* we must accept without question. Two riveting gangs at the shipyard of the Groton Iron Works, Groton, Conn., recently made five-day averages of 1,202 and 1,138 rivets per day. The work was of difficult character, being on oil-tight outer bottom work, ⅞-in. pan-head countersunk-point rivets. Each gang consisted of riveters, holder-on, passer and heater. Working nine hours per day, one gang made daily records varying from 1,185 to 1,241 rivets, while the other drove from 1,058 to 1,181 rivets per day. Not one of the rivets was cut out.

WHY WOULDN'T THE ZEPPELIN BE A FAILURE?

Aluminum in the framework of a modern German zeppelin, according to notes furnished to a London journal by a French officer, is used to the extent of 10 to 12 tons. This seems an enormous bulk, as the metal is so light. The covering of the 18 balloons enclosed inside the big outer envelope is made of a cotton substance, lined with "goldbeater's skin," instead of with rubber, and the quantity used is so

large that the intestines of 30,000 cattle go into the material for one zeppelin. Each of the 18 balloons is fitted with a valve, and separated from those on each side of it by a funnel to carry off the explosive mixture of the hydrogen of the balloons, the oxygen of the air, and the gases given off by the engines. When all five motors are working together, one contained in the forward car, one in each of the two side cars, and two in the rear car, the speed attained is 68 miles per hour, but, as a rule, all the engines are not used at one time, and the normal rate of flight is from 50 to 56 miles per hour. The ordinary crew consists of 22 men.

LIQUID OXYGEN EXPLOSIVES IN GERMANY

Le Genie Civil describes some recent German developments in the use of liquid air for blasting. The Sprengluft Gesellschaft m.b.H. manufacturers plants capable of supplying 22 lb. of rectified liquid oxygen ("oxyliquite") per hour, at a net cost of less than two cents per lb. The liquid oxygen is stored in a modified form of Dewar flask, usually of brass or thin steel, the jacket space being filled with charcoal, which absorbs any small amount of gas escaping through the pores of the metal. In utilizing the liquid oxygen for blasting, lampblack has been found the most satisfactory combustible material. Cartridge cases of cardboard are filled with the lampblack, and then immersed for some time in a tank containing the liquid oxygen, so that they become thoroughly impregnated just before use. They are usually fired by a small primer, preferably ignited by electricity. Oxyliquite is stated to be very efficient for mining, but is less suitable for quarry work. It is considered safer than the explosives generally used, since the cartridge is only explosive for ten minutes after the time of saturation with the liquid oxygen. This fact, however, makes it necessary to instal a liquid oxygen plant near the scene of operations.

THE MAN BEHIND THE MAN BEHIND THE GUN

By Marie Randall

I can't fight in the trenches 'cause my hair is gettin' gray,
And they say my days of work are nearly done;
But there's one thing that I'm proud of, and I say it every day,
I'm the man behind the man behind the gun.

Sometimes I'm feelin' mournful-like because I'm gettin' old
And younger lads are havin' all the fun;
But I keep a-working steady for I want to have it told
I'm the man behind the man behind the gun.

When trouble starts a-coming in the front line over there;
When our lads are gettin' hustled by the Hun;
We want 'em to be mighty sure the game is on the square
With the man behind the man behind the gun.

The boys will win the victory and make us mighty glad—
Sure, and one of them may be my only son.
I want him to come back and say "You helped us do it, dad;
You're the man behind the man behind the gun."

—*American Machinist.*

COMPRESSED AIR MAGAZINE

EVERYTHING PNEUMATIC

Established 1896

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We invite correspondence from engineers, contractors, inventors and others interested in compressed air.

Vol. XXIII. October, 1918. No. 10

CONTENTS

THE UNIQUE OPPORTUNITY

When these lines first greet the reader's eye the subscribing to the Fourth Liberty Loan will be in full swing, and our belated word must be of small account. These are the days when world records are being made in all fields, not only in the magnitude of the things which must be done but also in the magnificence of their accomplishment, and now it is upon us to make another record in keeping with the rest.

Not often do so many overwhelming considerations so imperatively urge to the doing of a thing as here and now, but the things which each must do vary incommensurably. First is the automatic call for the fighting men, and as it sounds they everywhere are dropping everything to respond. Some must give their life, and some their health and some their worldly prospects for the future, and none can say what else were right for them.

The other call, not more to be ignored nor less imperative, is for vast sums of money. It calls upon us all, and it calls not for what we have not. The call is neither to pay nor to give. The call is simply for investment without speculation, investment in the strongest savings bank in the world with full savings bank interest. We all know that these things are so, and that is all sufficient.

THE AMERICAN RIVETING ADVANTAGE

We print on another page of our present issue a rather astonishing account of the status of the pneumatic riveter in British shipyards, the matter being presented with such authority and precision of statement that it cannot be questioned. It is not easy to account for this lack of appreciation, and consequent insufficiency of employment of the pneumatic tool in this important field. It surely is not for lack of information on the uses of compressed air. It is a curious fact that in some of the larger and older of the British shipyards, as for instance that of Harland & Wolff—which, however, is in Ireland—compressed air is employed more numerously than in the United States for operating the large forging hammers which normally have been driven by steam.

The Engineer shows by actual figures that the pneumatic riveter does more work in any given time than the hand riveter and that it does it with fewer men per gang. It should

have mentioned also the additional fact of importance that the handling of the pneumatic riveter does not demand the practiced skill or the slowly acquired manual facility of the hand riveter. It takes years to develop a high class riveter while hours, or days at the most, are sufficient for an average man to learn all the manipulation of the air driven tool. The pneumatic riveter, moreover, does perfect work at once and does not require to be employed upon low class work until it gets its hand broken in. There is apparently no superiority of any kind to be claimed for hand riveting, unless it might be a certain picturesqueness resulting in the lack of absolute uniformity in the individual rivets.

It does not appear how much the prejudices and habits of the British workman may operate to retard the use of the pneumatic riveter, but probably this has no weight in the matter. It is rather a case of national inertia, and we have a curious corrobative instance of this in another article also to be found in our present issue. In this is reproduced a photo of a lot of women who have taken the places of men with pick and shovel and wheelbarrow for an extensive job of earth excavation. Why, with us in these days it would be impossible to find even men employed on such a piece of work as this, because we always do it with a steam shovel.

The universal adoption of the pneumatic riveter in shipbuilding, boiler making and other work to which it is adapted seems to be indisputably an industrial advantage for us, but we are not forgetting that there are other advantages which still prevail on the other side of the Atlantic, as is sufficiently evidenced by cheap and prolific production in many lines, and not least among the results of universal good which shall come out of the great shaking up of the nations must be not only mutual respect and appreciation but a greater familiarity with each other's means and methods, a general abandonment of the slow and worthless ways, and a reciprocal adoption of what is best, for the advantage of all.

A CORRECTION

In our August issue, page 8848-9, we reprinted from *Coal Age* a carefully prepared statement of the conditions necessary to be observed for the successful installation and operation of mine siphons. We regret that an unfortunate error occurred in the reprinting of a responsible formula which occurred in the formula. We reprint the formula below, calling attention to the last number of it, with below it the same number properly corrected.

$$(H - h_1)\frac{d_1^5}{l_1} = (h_2 - H)\frac{d_2^5}{l_2}; \text{ and } d_1 =$$

$$d_2^5\sqrt{\frac{(h_2-H)l_1}{(H - h_1)l_2}}$$

$$d_2\sqrt[5]{\frac{(h_2-H)l_1}{(H-h_1)l_2}}$$

THE ENDLESS ROAD OF INVENTION AND DISCOVERY

The following occurs in an address by E. W. Rice, Jr., President of the General Electric Company, to a graduating class of students:

I have been engaged in engineering work, mainly electrical, for nearly forty years, during which time the entire electrical industry may literally be said to have had its birth and development—the telephone, electric light, electric motor, trolley cars, wireless telegraphy, wireless telephone, electric transmission of power—all these have appeared since my first youthful venture in electrical work.

Now on a number of occasions, during these forty years, a lull in new inventions and discoveries seemed to have come about; and on such occasions I have talked with eminent engineers and inventors who all agreed that there was nothing more of importance in our line to be discovered. This conviction was strongest about thirty years ago; fairly strong about twenty years ago; a little weakened but still existing fifteen years ago, but now is a dead doctrine. I have had no such discussion for over ten years and do not expect to have another so long as I live, for facts have been against that theory, and of course facts are such stubborn things that theory which contradicts facts must be abandoned.

The first steel ship built without rivets, so far as known, has just been launched on the south cost of England. The plates were fused together by electric welding in one process. General adoption of this process, it is held, would effect a saving of from 20 to 25 per cent. in both time and material.

NEGLECT OF PNEUMATIC RIVETING IN BRITISH SHIPYARDS

The following which we reprint from a recent issue of *The Engineer*, London, deserves careful reading, although the readers most to be benefited are not in the United States.

It is common knowledge, the writer says, that the rate of out put of merchant shipping falls far short of what is necessary and possible. Even if the two most obvious causes of this, viz., shortage of skilled labour and bad time-keeping, loss of time by the workman, were removed, the output would still remain far below what is easily possible. One of the principal reasons for this is simply that British shipyards make very little use of pneumatic tools. To what extent the capacity of shipyards may be affected by the use of pneumatic riveting instead of hand riveting, the following figures will show.

HAND RIVETING AND PNEUMATIC COMPARED

According to information recently received from one of the leading East Coast shipyards, the best day's work on a shell with pneumatic riveting is 700 rivets of seven-eighths of an inch diameter, and for hand work, under the same conditions, 430 rivets. An average day's work, however, is considerably less than this, and may be taken as being 510 rivets with pneumatic riveters against 264 with a hand squad, the figures being taken for work on all parts of one ship. The number of rivets driven per day by a riveting squad varies, of course, according to the part of the ship worked upon and the size of rivet used. The following may be taken as indicating the difference in one day's work of a hand and pneumatic riveting squad:—On the shell, with ⅞-in. rivets, hand riveting, 260 to 360 rivets, with pneumatic riveting, 500 to 550; on the deck, with ⅝-in. rivets, hand riveting, 450, pneumatic 700; on the deck, with ¾-in. and ⅞-in. rivets, hand riveting 350, pneumatic 550.

PNEUMATIC RIVETING TAKES FEWER MEN

The greatly increased output of work secured by the pneumatic tool is in itself sufficient to establish its very considerable superiority over the hand method. But it has another very important advantage. A hand-riveting squad consists of three men and one or two boys. From two of these squads, three pneumatic riveting squads can be formed, thus effecting a saving of 50 per cent. in labour alone. A third advantage claimed for the pneumatic tool is that it gives both the other advantages with less exertion and consequently less fatigue on the part of the men.

ACTUAL FIGURES FROM BRITISH YARDS

With these advantages to its credit, it is, nevertheless, the fact that the pneumatic tool is greatly neglected in British shipyards, as the following facts and figures, taken from the returns of 70 of the leading yards of the country, will show. Only yards having berths of over 250 ft. in length are taken. It may be said in passing, that the equipment necessary for the efficient working of a berth is generally considered to consist of a compressor plant of 1000 cubic feet per minute capacity, to supply the compressed air for driving the tools, and 60 pneumatic tools, of which 20 should be riveting hammers. Taking the ten best-equipped yards in the country, they have, as a rule, compressor plants of 1000 cubic feet per minute per berth, but only 52 pneumatic tools, of which only 1½—on the average—instead of 20 are riveting hammers. The average of the remaining 60 yards is much below even this standard. It shows only 21 tools per berth and 333 cubic feet per minute compressor capacity per berth. Moreover, only about one-eighth of the number of riveting hammers in stock in the yards are actually used. Then again, there are 22 important yards in the country, with a total of 77 berths, which have no pneumatic plant whatever.

THE NATURAL CONSEQUENCES

Shortage of riveters is, beyond question, one of the chief causes, or the chief cause of deficient output at the present moment. This shortage is no new thing in the British yards, where for the last eight or ten years the supply of riveters has fallen short of the demand. War and other causes have further reduced their number, while the volume of work has been increased. The serious effect of this state of affairs on the output of ships must be obvious. In some yards, ships completely plated cannot be launched because they cannot be riveted. The solution of the problem is to be found to a very great extent in the greatest possible use of the pneumatic tool. The United States yards, by their almost universal employment of pneumatic riveting tools, have been able to overcome their shortage of skilled labour.

ABOUT GASOLINE

By Augustus H. Gill

The term gasoline was formerly applied to the higher portion obtained by distilling crude petroleum, more particularly that above 80 deg. Baumé (pronounced bomay). The name means "like gas" and is derived similarly to "butterine" and other words of like ending.

Owing to the present great demand for gasoline, anything lighter than kerosene (45 deg. Baumé), and even some of that, finds its way into the commercial article, which then becomes really naptha, an intermediate product. This designation "deg. Baumé" refers to degrees on the hydrometer devised by Baumé for measuring the densities of liquids lighter than water. It is a weighted glass spindle which sinks to a greater or less depth in a liquid, according as it is light or heavy. Thus in water it sinks but 10 deg., in engine oil to 25 deg., in kerosene to 45 deg., in motor gasoline to 60 deg. and in illuminating gasoline to 86 deg. These are spoken of as "86-deg. gasoline," etc. But this designation refers simply to the weight of the liquid, or "gravity" as the oil man says, and it has nothing to do with boiling point, freezing point or percentage composition; it is simply a commercial way of naming the different grades. To a certain extent, however, it is a measure of the volatility, or ease with which it is converted into vapor, for the higher the number or "test" the more readily is the gasoline changed into vapor. While this "gravity" or hydrometer test is the one commonly employed, it is a very unsatisfactory and unreliable test, as mixtures can be made which will have the same gravity and yet one will be very unsatisfactory; for example, a mixture of equal parts of 56 and 86 deg. and one of 25 per cent. each of 56, 66, 76 and 86 deg. will have the same gravity (71 deg.), and yet the latter will work much better than the former, which will vaporize irregularly and tend to make an engine run unevenly. This extremity of mixture would be revealed in a distillation test that consists in boiling the gasoline, condensing the vapor to a liquid and noting the quantities that come over at the different boiling temperatures. In the gasoline made up equally of an 86- and 56-deg. mixture the quantity of low-boiling and of high-boiling distillate would run nearly even in volume.

Gasoline is made in three different ways: First, by distilling crude petroleum on a large scale, as is done on a small scale in the distillation test just described; second, by "cracking" the heavy oils, engine oils, etc., by great heat and pressure (Rittman and other processes); third, by causing natural gas under pressure to pass through cooled tubes when the gasoline vapors it contains are chilled out of it (this is called "casing-head" gasoline).

While gasoline ignites at 1400 deg. F., a dull-red heat, it cannot be ignited by a soldering copper, a cigar or cigarette, but woe to the man who uses a blowtorch or lights a match in the proximity of gasoline vapor. The temperature of these flames is about 2100 deg. F., therefore much above the ignition point of gasoline. In use it is ignited by a voltaic or dynamic spark but the fact must not be overlooked that it can also be fired by frictional electricity. One of the earliest accidents of record caused by frictional electricity was the "hair-dresser's accident" in 1897. A woman was being shampooed with a wash containing gasoline when sufficient frictional electricity was generated to produce a spark which ignited the vapor, burning her so severely that she died. A naval surgeon wearing a fur coat and rubber boots (which insulated him from the ground) made a spark, presumably by friction on the fur, sufficient to ignite the gasoline in the tank of an automobile. Sparks of considerable intensity are not infrequently generated from furs. Gasoline is electrified by passing through chamois skin or a rubber hose. Automobiles have been set on fire by a spark from a chamois-lined funnel used in filling the tank, and perhaps insulated from it by a wooden block or from a hose through which gasoline is pumped when the cock on the end did not touch the tank. The chamois should be replaced by 80- to 100-mesh brass gauze, and the hose and cock should be grounded by a chain connecting them with the metal storage tank. In filling cans, for example, they should be connected with the gasoline pump by a chain or wire because sometimes the friction of the gasoline in the pipes makes electricity enough to cause a spark to jump from the pump to the can, firing the gasoline.

In handling gasoline it should be remembered that the vapor is heavier than air (3.5 times) and settles. It flows like a stream and

has been known to run in a stratum and become ignited from a boiler fire 60 ft. away. Gasoline does not explode except in a confined space; the explosive range, that is, the percentage necessary to make air explosive, is between 1.5 and 6. In other words, an air mixture containing one and one-half to six volumes of the vapor in one hundred is explosive. Putting it another way, two quarts of gasoline, if diffused through a room 10x10x10 ft., would make a first-rate explosion. This is equal to about 5 tablespoonfuls in a 5-gal. can. The following table shows the number of cubic feet of vapor produced by different quantities of gasoline:

Liquid Gasoline.	Gasoline Vapor. Cu.Ft.
128 liquid oz. (1 gal.)......	32
64 liquid oz. (2 qt.).......	16
32 liquid oz. (1 qt.)	8
8 liquid oz. (½ pt.)	2
4 liquid oz. (1 gill)	1
½ liquid oz.	⅛ (App. 1 gal.)

One volume of the liquid becomes 240 volumes in the vaporous condition.

The heating value of gasoline varies from about 17,860 B.t.u. (for 62 deg. Baumé) to about 18,080 B.t.u. (for 76 deg. Baumé) per pound, or 109,024 and 102,152 B.t.u. per gallon respectively; that is, the heavier gasoline has the greater heating value per gallon and less per pound.—*Power.*

TRANSVAAL POWER PLANT DATA

The Victoria Falls and Transvaal Power Company is the largest power undertaking in the Briitsh Empire. Approximately 837,000,000 units (kilowatt hours), or 1,120,000,000 h. p. hours were sent out of the generating stations in the year 1917. This involved burning over 1,000,000 tons of coal, a large proportion of which consists of duff, and is a byeproduct from the collieries. The year's operations involved the heating and evaporating into steam of about 6,500,000 tons of water and this quantity was passed through the turbines and condensed in the surface condensers, which required the circulation of approximately 78,000,000,000 gallons of water. The total number of units sold for lighting, power and tramways by the Public Utility Companies and Municipalities of Greater London for the year 1916 was approximately 450,000,000 units, or about 40 per cent. less than the units sold by the Victoria Falls and Transvaal Power Co., Ltd., to the mining industry on the Witwatersrand.

COMPRESSED AIR BY THE TON

The compressed air supply is much the largest in the world. During the year 1917 no less than 2,000,000 tons of air passed through the main pipe network from the two compressor stations to the mines for use in driving rock drills, etc. At the time of maximum load each day air is delivered at the rate of about nine tons per minute. Approximately 20,000,000 tons of air were passed through the boiler furnaces and up the smoke stacks in the year 1917.

SUBMARINE MINES

Generally speaking, there are two types of mines: fixed and floating. The fixed or stationary mine is fired by contact, electricity, timing device or fuse. Such mines, which are extensively used by all navies, are rugged in design and may contain large charges of explosives. They are placed in position by submarines and other specially equipped mine-laying vessels. Such a mine is provided with an anchoring device and is deposited, if possible, in harbors and channels of the enemy or in the path of ocean travel.

Floating mines differ from fixed mines in that they are unanchored, and unless guard boats are at hand to warn friendly vessels of their proximity, may be as dangerous to friend as to foe. Such mines must be, according to the laws of war, designed to become inoperative within a few hours after being set adrift.

The German floating mines are often cast adrift in pairs, connected by a line about 100 feet long. If a ship runs between the two mines, they are drawn alongside the ship and exploded.

Many proposals have been received suggesting the use of a contact depth mine which will rise to the surface if floating to contact. This type, however, is considered unnecessary and inadvisable. The essence of the depth charge is that it explodes in the vicinity of the submarine, in case it fails to strike the boat itself. The use of the contact depth mine presupposes the necessary accuracy to strike the target. The

recovery feature is of no particular value, and would necessitate numerous safety precautions to ensure absolute safety in picking up. *Bulletin No. 2, Naval Consulting Board.*

PARIS GREEN—POTATOES—AIRPLANES

The means by which the Nation's supply of Paris green escaped serious curtailment is announced by the Food Administration.

The supply of acetic acid, heretofore considered indispensable in the manufacture of Paris green, was taken over some months ago for the manufacture of airplane "dope," the material used for making the cloth on airplane wings weatherproof.

In co-operation with the War Industries Board, the chemical experts of the Food Administration called a trade conference at which the situation was outlined and plans solicited to solve the acetic acid shortage. By arrangement with large yeast manufacturers, vinegar, which contains about 10 per cent. acetic acid, is now being supplied manufacturers of Paris green, of which an adequate supply—at least, normal—is now assured. Department of Agriculture experts advise also that lead arsenate and calcium arsenate, which are cheaper (especially the latter), can be used as an equivalent substitute for Paris green in many cases.

It is striking that the acetic acid which formerly went into Paris green with which farmers fought the ravages of insects is now contributing to the efficiency of airplanes with which American boys are raining destruction on the Nation's greatest enemy, the Hun. Although technical experts have protected agriculture against a shortage of Paris green, this case is typical of commercial readjustments which may from time to time be necessary.

NOTES

The Royal Air Force has issued a statement showing the enemy losses in aircraft as compared with Allied machines missing from July 1, 1917, to June 30, 1918, on the Western front and during shorter periods on other fronts. The total number of enemy machines destroyed is 2,985; of enemy machines driven down, 1,117; of Allied machines missing, 1,213.

Gas is to be used exclusively for rivet heating, plate bending and general fabricating heating purposes hereafter at the Bethlehem Shipbuilding Corporation's Alameda plant. This is a radical departure from the shipbuilding methods that have been in use for years, whereby it was thought that only coke could be used—even oil was considered an innovation.

The flash point of an oil is the lowest temperature at which the vapors arising therefrom ignite without setting fire to the oil itself when a small test flame is quickly approached near its surface in a test cup and quickly removed. The flash point of lubricating oil is higher than the boiling point, while that of alcohol, benzine, kerosene, etc., is lower.

The "salting" of wooden ships at the shipyards of the Foundation Co. at Portland, Ore., is being facilitated by the use of an air jet. Salt is placed between the ceiling and planking of all wooden ships as a wood preservative. Ordinarily the process delays the planking. Under the method followed by the Foundation Co. a hole is bored through the ceiling and the salt blown into place by means of the air jet.

Of 47,243 soldiers in the United States Army training detachments being given vocational training for overseas service, 17,429 are being taught auto mechanics, 5,450 auto driving, 2,137 blacksmithing, 4,506 carpentry, 2,969 electricians, 1,251 gas engine, 1,130 general mechanics, 2,054 machinists, 3,724 radio operation, and 996 sheet metal work. The other work varies from that of wheelwrights to cobblers and locomotive engineers.

Tunnel connection of Denmark and Sweden has recently been proposed, with a view to carrying electric railway traffic across the strait. According to a note in the *Schweizerische Bauzeitung,* the location selected extends from the island Amager, near Copenhagen, Denmark, to the island Saltholm and thence to Lunhamn, near Malmö, Sweden. The line is 22 miles long, including tunnel and surface portions. Its cost has been estimated at $25,000,000.

Two royal air force officers, with two mechanics, recently completed a flight from England to Egypt, a distance of 2,000 miles, in a type of airplane that has seen considerable service on the front. The official report in announcing this feat, says: "One or two halts were made for petrol, but the flight was merely a bit of routine work."

In England for the heavy chucks used with large power-operated lathes instead of relying upon manual power to close and open the chuck compressed air is largely used. This saves the women's energy, in fact, making possible work that probably could not otherwise be done by them, reduces time of setting up and taking down the job, and thus speeds up production. It is claimed that the use of compressed air in this way increases production from 20 to 100 per cent.

Representatives of manufacturers of power-driven portable vacuum cleaners have agreed with the Conservation Division of the War Industries Board to reduce their lines to not more than two models or sizes, to discontinue the manufacture of less essential attachments and discontinue use of metals where not absolutely essential. These plans will result in an annual saving at least 100 tons of steel, 5 tons of brass, 125 tons of aluminum and 1,000,000 ft. of rubber hose.

The record for holes punched singly in 10 hours has been broken by the Ferguson Steel & Iron Co. of Buffalo, which is fabricating and assembling 16 steel barges for the United States Railroad Administration. A. Rostowicy, expert puncher for the Ferguson company, punched 18,624 holes in 10 hours, most of the holes being about 4 in. apart. This breaks the record held by Charles Milburn of Chicago, who several years ago punched 18,310 holes in 10 hours.

One of the mechanical wonders of the war is the moving bakery used by the British. This is a portable machine capable of mixing the flour into dough, molding the dough and dividing it into predetermined weights. The machine is mounted on a specially constructed motor truck so that it can follow the troops. With a crew of five men it will make 6,000 loaves of any size, shape, or weight in one hour. This is the same amount of work which formerly required 112 army bakers mixing bread in the field by hand.

The new Liberty plant of the Bethlehem Shipbuilding Corporation at Alameda, Cal., will be twice the size of the Victory plant of the Bethlehem Shipbuilding Corporation at Squantum, Mass., and will involve twice the expenditure. The plant, which will have 10 shipways, will cover more than a third of a square mile and from 3,000,000 to 4,000,000 yds. of dredging will be necessary. Large vessels will be constructed, contracts for which have already been awarded by the United States Shipping Board.

A series of tests with stenches as a warning for miners is being made by the Bureau of Mines. A liquid chemical is injected into the compressed-air line at the engine room. The vapor thus is carried quickly to the farthest opening of the line. About five minutes are required for the warning to be received at a punching machine which is approximately 1800 ft. from the compressor. The odor soon diffuses to all near-by parts of the mine, and is carried along by the ventilating current. The laboratory work in this connection is being done in the gas section under the direction of Lieutenant Katz. The most disagreeable nontoxic odors obtainable are being tried.

Four engineers have been named by the fuel administration to undertake savings in power plant fuel consumption. These are Thomas R. Brown, Pittsburgh, formerly special engineer with the Westinghouse Air Brake Co., for the western half of Pennsylvania; George R. Henderson, Philadelphia, formerly consulting engineer with the Baldwin Locomotive Works, for the eastern half of Pennsylvania; Edward N. Trump, New York, vice president of the Solvay Process Co., for New York state; and W. R. C. Carson, Hartford, a consulting engineer, for New England. The principal question under consideration is the waste of coal in the 250,000 industrial power plants of the country.

Germany has conquered Belgium, Poland, Serbia, Lithuania, Courland and Frinli. But the Allies have conquered cotton, wool, jute, leather, rubber, copper and feeding-stuffs.

LATEST U. S. PATENTS

JULY 9

1,271,544. VACUUM MILKING-MACHINE. Claude Hudson Davis, Wanganui, New Zealand.

1,271,545. GRAIN-CLEANER. Monroe Davis, Enid, Okla.

1,271,562. AIR-PUMP CHECK. Robert A. Gally, Cincinnati, Ohio.

1,271,712. UTILIZING AN EXPANSIVE FORCE. Herbert Alfred Humphrey, London, and William Joseph Rusdell, Dudley, England.

1. The method of speed control of a fluid motor operating under varying fluid velocities, which consists in producing one force which is a function of the speed of such motor, another force which is a function of the torque thereof, and in balancing said forces against each other and regulating the load on the fluid motor in accordance with the point of balance, so that the motor is maintained at a predetermined speed for each fluid velocity.

1,271,956. AUTOMATIC LIQUID-ELEVATOR. William Hurley Smith, Deming, N. Mex.

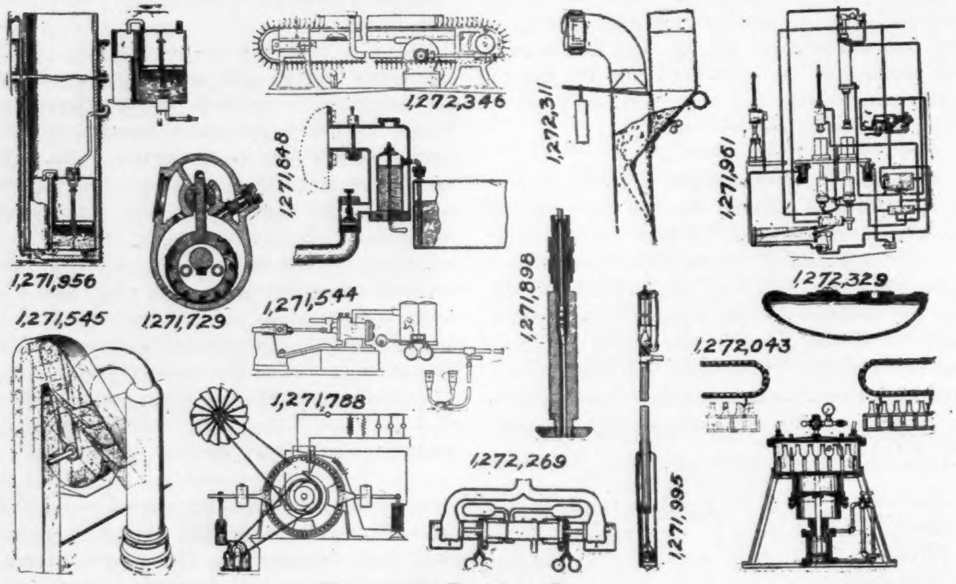
1,271,961. GLASS-FORMING MACHINE. William S. Teeple, Wellsburg, W. Va.

1,271,995. DEEP-WELL PUMP. Daniel Beedy, Colby, Kans.

1. In a lift pump, the combination with an air reservoir adapted to have direct communication with a pump cylinder, said air reservoir having a closed top, of a water supply pipe extending into and through the air reservoir through the closed top and of such smaller diameter than the air reservoir as to leave of material air receiving space thereby between and a plurality of lateral openings formed through the lower end of the water supply pipe.

1,272,043. METHOD OF TESTING AERATED-BEVERAGE CONTAINERS. John A. Hoff, St. Louis, Mo.

1. The method of testing containers of aerated liquids which consists in submerging the container in a body of liquid confined in a suitable tank or holder, and withdrawing a portion of the liquid body from its original confines to



PNEUMATIC PATENTS JULY 9

create a vacuum in the space originally occupied by the volume of the liquid thus withdrawn, whereby the container is subjected to a test under the absolute pressure of the contained gases.

1,271,729. COMPRESSOR. Laidslav F. Kristufek, Chicago, Ill.

1,271,788. VARIABLE-POWER REGULATION. John A. Snee, Jr., West Elizabeth, Pa.

1. An elastic fluid pump operating without a fly wheel, which comprises a power chamber having inlet and discharge valves, a play pipe in operative relationship therewith containing space for a reciprocating piston, means forming a space in advance of the piston for an elastic fluid with inlet and discharge valves, a piston adapted to be actuated in one direction, by the energy of a primary actuating medium to compress and deliver elastic fluid, and in the opposite direction, the return stroke, by elastic fluid pressure, and means comprising piston, cylinder, and discharge port suitably located with respect to the compression space beyond, whereby the total energy stored in the elastic fluid utilized for causing the return stroke is maintained approximately constant.

1,271,848. VACUUM-FEED CARBURETER. Thomas William Burr, Stoneham, Mass.

1,271,898. PNEUMATIC VALVE. Edward E. Holtz, Chicago, Ill.

1,272,269. UTILIZING AN EXPANSIVE FORCE IN THE MOVEMENT OF LIQUID. Herbert Alfred Humphrey, London, England.

1,272,311. PNEUMATIC SEPARATING SYSTEM. Harold M. Plaisted, Granite City, Ill.

1,272,329. PNEUMATIC ABDOMINAL SUPPORT. Rose Schuessler Carling, Los Angeles, Cal.

1,272,346. APPARATUS FOR DRYING BOTTLES. Frederick L. Jefferies and William Spain, Riverside, Ill.

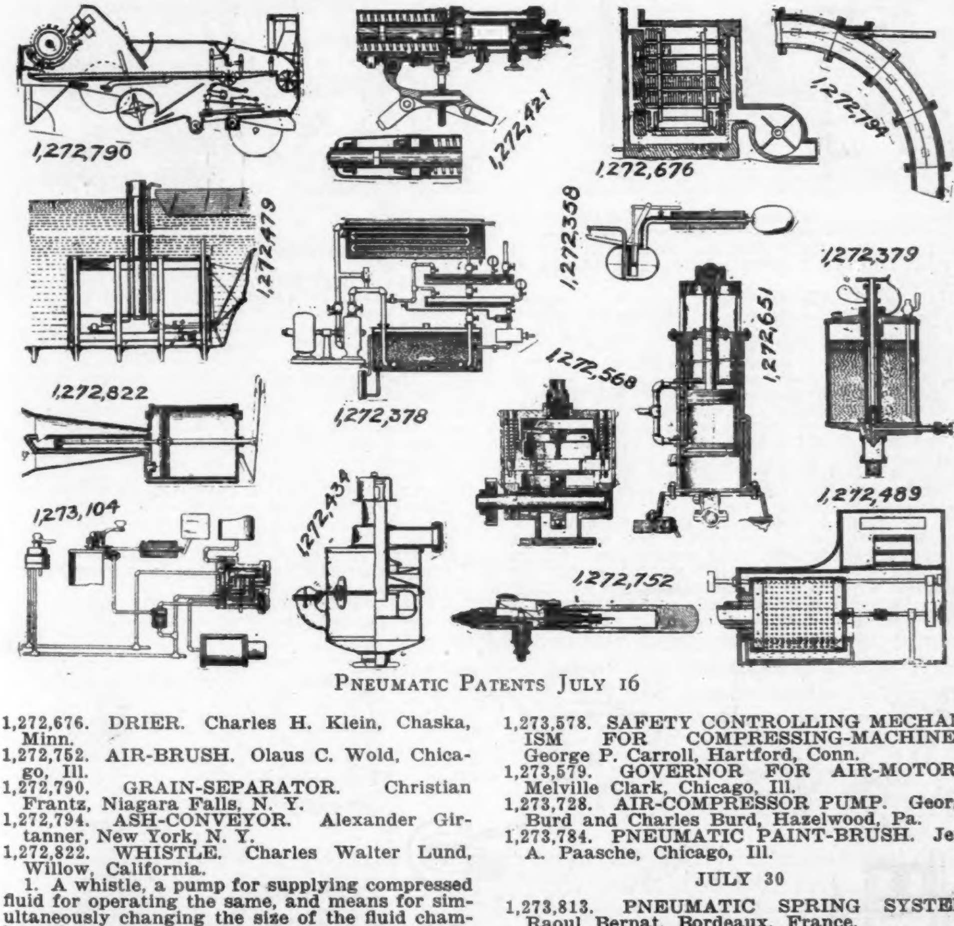
JULY 16

1,272,358. PORTABLE SOLDERING DEVICE. John Montgomery Bell, Chester, S. C.

1,272,374. METHOD OF PREPARING VACUUM-TUBES. Oliver Ellsworth Buckley, East Orange, N. J.

1,272,378. POWER-GENERATING APPARATUS. Elbridge C. Collins, Detroit, Mich.

1,272,379. AIR AND LIQUID SUPPLYING DEVICE. Frank W. Collins, Mainstee, Mich.
1,272,421. APPARATUS FOR THROWING PROJECTILES. Angelo Glissenti, Brescia, Italy.
1,272,434. AIR-WASHER. Donald T. Hastings, Detroit, Mich.
1,272,438. AIR-BRUSH. Stephen J. Heinrich, Newton Highlands, Mass.
1,272,479. METHOD OF BUILDING FOUNDATIONS FOR SUBAQUEOUS TUNNELS. Duncan D. McBean, New York, N. Y.
1,272,489. DUST-COLLECTOR. Frank A. Marascio, Phillipsburg, N. J.
1,272,568. AIR-PUMP. Willis A. Swan and William A. Higgs, Detroit, Mich.
1,272,611. AIR-COMPRESSOR. Charles L. Braley, Cincinnati, Ohio.
1,272,651. AIR-COMPRESSOR. Lewis L. Foster, Govans, Md.
1,273,171. GAS AND AIR MIXER FOR GLASS-FURNACES. Emile Majot, Maunmee, Ohio.
1,273,255. PNEUMATIC STRAW-STACKER. Wallace F. MacGregor, Racine, Wis.
1,273,303. AIR-TORPEDO. Frank B. Wuebben, Dayton, Ohio.
1,273,304. PRESSURE-REGULATING VALVE. Charles E. Yates, Detroit, Mich.
1,273,343. PUMP FOR VACUUM-CLEANERS. Charles Endorf, Jr., Chicago, Ill.
1,273,366. COMPRESSOR FOR REFRIGERATING APPARATUS. Fred J. Heideman, Detroit, Mich.
1,273,483. TIRE-PUMP FOR AUTOMOBILES. Thomas A. Halleran, Flushing, N. Y.
1,273,501. APPARATUS FOR CHARGING COMPRESSED AIR WITH ATOMIZED LIQUIDS. Walter Edward Kimber, Harlesden, London, England.



PNEUMATIC PATENTS JULY 16

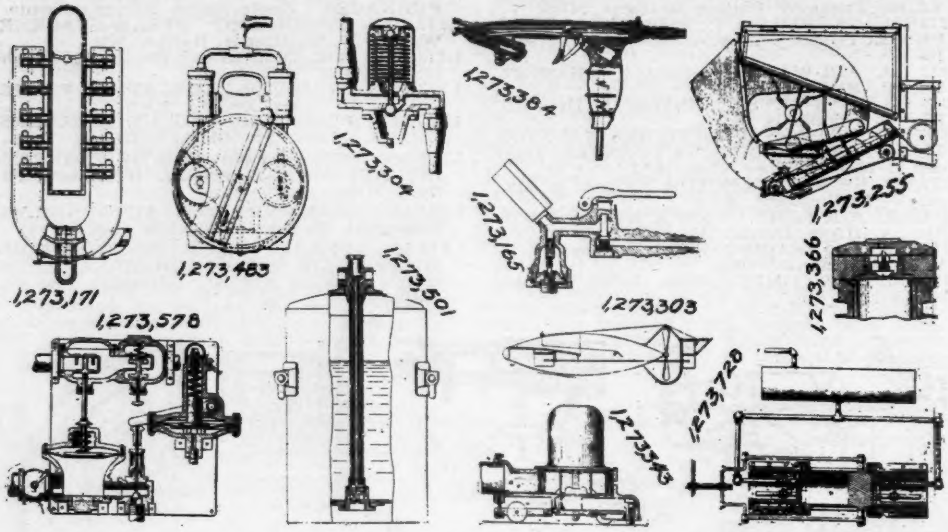
1,272,676. DRIER. Charles H. Klein, Chaska, Minn.
1,272,752. AIR-BRUSH. Olaus C. Wold, Chicago, Ill.
1,272,790. GRAIN-SEPARATOR. Christian Frantz, Niagara Falls, N. Y.
1,272,794. ASH-CONVEYOR. Alexander Girtanner, New York, N. Y.
1,272,822. WHISTLE. Charles Walter Lund, Willow, California.
1. A whistle, a pump for supplying compressed fluid for operating the same, and means for simultaneously changing the size of the fluid chamber of said whistle with the movement of the piston of said pump.
1,273,097. ROCKING-CHAIR FAN. Joseph Schmalzl, South Bethlehem, Pa.
1,273,104. SAFETY CAR CONTROL. Walter V. Turner, Wilkinsburg, Pa.

JULY 23

1,273,165. AIR-GAGE DEVICE. George H. Erich, Minneapolis, and David S. Milne, Fairmont, Minn.
1,273,578. SAFETY CONTROLLING MECHANISM FOR COMPRESSING-MACHINES. George P. Carroll, Hartford, Conn.
1,273,579. GOVERNOR FOR AIR-MOTORS. Melville Clark, Chicago, Ill.
1,273,728. AIR-COMPRESSOR PUMP. George Burd and Charles Burd, Hazelwood, Pa.
1,273,784. PNEUMATIC PAINT-BRUSH. Jens A. Paasche, Chicago, Ill.

JULY 30

1,273,813. PNEUMATIC SPRING SYSTEM. Raoul Bernat, Bordeaux, France.
1,273,900. VACUUM SYSTEM. Frank W. Miller, Chicago, Ill.
1. A vacuum system comprising a casing, a rotable spiral conveyor disposed vertically therein, a sediment collecting receptacle connected with the bottom of said casing, an air inlet pipe connected to one end of said casing, a discharge pipe connected to the opposite end of said casing, and means for delivering water or other liquid in regulated quantities to said air supply pipe.



Pneumatic Patents July 23

1,273,905. PRESSURE-REGULATOR FOR PNEUMATIC TIRES. William M. Myers, St. Joseph, Mo.

1,273,910. HAND-BRAKE. John F. O'Connor, Chicago, Ill., assignor to William H. Miner, Chazy, N. Y.

3. In a brake rigging having power controlled brakes, the combination therewith of auxiliary, manually controlled, adjustable means for applying variable predetermined braking forces.

1,273,929. METHOD OF TREATING GASES. Abraham Cressy Morrison, Essex Fells, N. J.

1,273,942. OIL-BURNER. John F. Smith, Seattle, Wash.

1,274,036. AIR-OPERATED CLAMPING DEVICE. Merbitt R. Hansen and Alfred C. Houser, Columbus, Ohio.

1. In molding apparatus, the combination of a turn over support for a core box or flask, a cylinder movable with said support and having a piston, a clamp actuated by the piston for clamping a plate or board to the box or flask, pipe connections with the cylinder at both sides of the piston and a valve for regulating the admission and exhaust of pressure medium to the cylinder.

1,274,055. PNEUMATIC ACTION. Alfred Johnson, Arthur C. Swanson and Alfred H. Utterberg, Chicago, Ill.

1,274,058. AIR-CLEANER AND PROCESS OF CLEANING AIR. Oswald Kutsche, Pittsburg, Pa.

7. The method of treating air, which consists in causing the air to flow at high velocity through a spiral tube located in a strong magnetic field, and separately removing gases from the outer and inner portions of the tube.

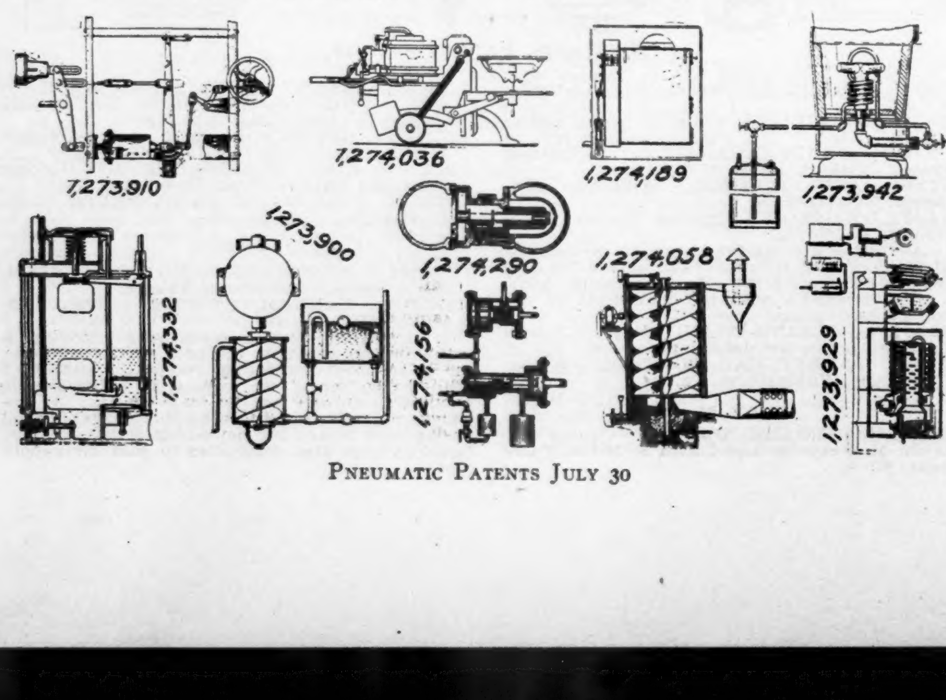
1,274,156. AIR-BRAKE MECHANISM. David J. Franklin, Columbia, S. C.

1,274,189. FLUID-PRESSURE RECORDER. Theodore W. Newburn, Edgewood, Pa.

1,274,193. AIR-BRAKE SYSTEM. George J. Pilger, Scranton, Pa.

1,274,290. REPEATING ACCELERATOR FOR COMPRESSED-AIR BRAKES. Joseph de Lipkowski, Paris, France.

1,274,332. PNEUMATIC PUMP. Homer S. Rogers, Milwaukee, Wis.



Pneumatic Patents July 30